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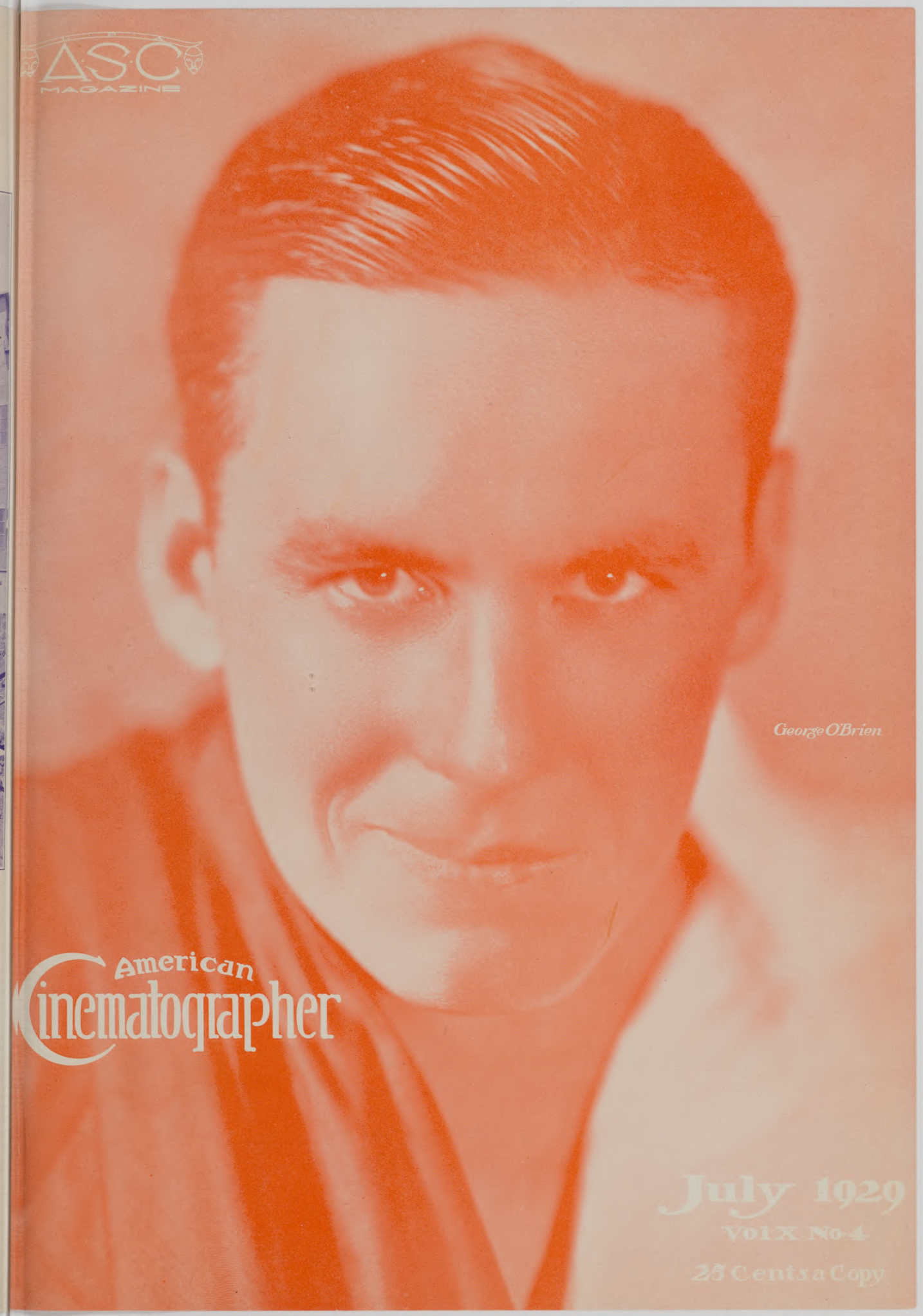

George O'Brien

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FOREIGN REPRESENTATIVES

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Riders of the Skies!

No, these men are not hurlers of death-dealing bombs. They are just cinematographers as they appear in action while "shooting" motion picture aerial thrillers. Lower right (full length) is Harry Perry, A. S. C., about to start for the heavens while making "Hell's Angels."

The other two pictures above are of Elmer Dyer, A. S. C., in aerial action and in repose. Inset shows Harry Perry and one of his aerial crews shot while "Hell's Angels" was being made. Standing, left to right: Billy Tuers, Elmer Dyer, Harry Perry and the late E. Burton Steene.

ALL IN THE DAY'S WORK

Whenever A Thrilling Air Scene Flashes Across the Screen—Remember, A Cameraman Was Up There, Too—Always Right "On the Tail" of the Actor's Plane. But, They Are Modest Men

By LORETTA K. DEAN

[This is the first of a series of articles about A. S. C. members who have been meeting romance, excitement and adventure in all climes while going about their daily task of photographing the stars. How Dan Clark, A. S. C., shot an under-water picture in a home-made diving bell will be a high spot in next month's article.—Editor's Note.]

NO MATTER what happens keep on the tail of that plane all the time. If it crashes I want the crash. Stay with it all the way." The speaker was a motion picture producer talking to his cameraman who was about to take the air. He meant business. The cameraman didn't even smile. Just nodded his head and climbed aboard the camera plane.

A half hour later the plane he had been told to follow had crashed to the ground. Only a burning mass of wreckage was left from which was fished the dead remains of a man who had been keeping smoke pouring from the plane. The pilot had jumped. But the smoke maker had stayed to the end—either because he did not hear the warning of the pilot, or for some reason that will never be known.

And—as the plane dropped like a plummet from the sky it was followed by a cameraman, a member of the A. S. C., who "got" every foot of it from the start to the unforeseen and tragic end. That cameraman was E. Burton Steene, who died less than a week later. Died from heart trouble. Whether or not his heart had been affected by the many, many wild flights he had made in his years of photographing in the air is something no one will ever know. But, the fact remains, he "got" his picture. Always got them. Always followed through. That is a way cameramen have.

We often read the startling stories of the feats of the actors and their "stunt doubles" in the air. We thrill at the narrow escapes they have experienced. We drop into our favorite theatre and sit with mouth agape watching the latest air picture and our blood runs cold as we see the star go through the death-defying stunts.

But—how many of us ever stop to realize that a cameraman was "on the tail" of each spectacular stunt we see on the screen. Riding like a mad man standing up in the plane with his body often twisted in weird shapes as he swings his Akeley about to keep the plane of the actor in his line of vision!

And always with the command of the director and producer ringing in his ears: "Follow that ship no matter what happens—we want it—"

Modest men are these cameramen of the air. Ask them about the thrills and they start telling you about the difficulties of getting the right filters for terial work where their altitude is changed so swiftly that they run into different light conditions in the twinkle of an eye.

Take Elmer Dyer, for instance. I tried to get him to tell me about his thrills. Elmer is one of the outstanding photographers of the air.

"Well," said Elmer, "sometimes it's tough up there. You see we get all set for the light conditions at five thousand feet. Then a bird gets his ship all twisted up and starts for the ground hell bent and we have to follow him, windering if he is in a stunt or a real fall that will be a smash. First thing you know the darned light has changed so much that you don't know whether you will get a good picture or not. And on the ground the producer is yelling for perfect shots. . ."

"Yes," I broke in, "But what about the thrills?"

"Oh yes," resumed Dyer, "that's so. Well, I have worked out a filter idea that makes me happy, for I know I'll get good pictures as long as I can keep a bead on the ship I'm after. I wouldn't tell you the secret of those filters for anything. But we can go through all kinds of air and light conditions and still have pictures that are what the producers want."

Try and get him to talk on the thrills and hazards!

"Oh, yes," suddenly exclaimed Dyer, "I remember one."

Imagine a man forgetting an airplane thrill!

"It was away back in 1925. I was flying in a plane with Dick Grace as pilot. Things were going great and I was tickled pink with the results we were getting. Dick and I had talked it over on the ground and we had planned our work all out. Everything was going great. We had signals all arranged and we were working together like a charm.

"Then came a shot that was to be a whiz bang! Grace was to suddenly go into a falling leaf so we could get a particular effect. I had one camera strapped to each side of the cockpit and when we were to go into the leaf he was to signal me and I was to fasten my belt on and hop to the other camera and signal him back.

"He signalled all right. I guess I must have gotten my signals all balled up for I gave him the wrong one and he went into that leaf while I was crossing to the other camera without my belt on me. The ship lurched and I started head-first out of the plane. I thought for a second I was surely gone. But I grabbed onto that camera and hung on for dear life.

"The ship gave another lurch and what he went into then I never did know, for I lost my grip on the camera and dropped down into the cockpit so hard I was partly stunned. Well, it's all in the game, but I didn't enjoy that little episode at all." And Dyer leaned back and laughed heartily as he thought of how narrowly he had escaped death while doing the everyday duities of a cameraman in the air.

Funny fellows these cameramen. Absolutely fearless. And then, some producers kick like steers when the cameraman demands ex-

Alvin Knechtel, at camera, and Col. Arthur Goebel, famous trans-Pacific and trans-continental flyer, about to go aloft to "shoot" a picture.

tra pay for going into the air. Who wouldn't ask it, Mr. Officer?

Dyer has been a flying cameraman since 1918 when he flew with the great Locklear. Steene flew with Locklear also. And Dyer has never been hurt yet. But he has photographed the aerial scenes of "The Winged Horseman," "The Great Air Robbery," "The Big Hop," "The Air Circus," and did a lot of work on "Hell's Angels," as well as the air work on "Flight."

All that happened to him in "The Winged Horseman" was that his face and hands were frozen while in the air on one sequence. But, like all cameramen, he makes light of that.

"I guess this air stuff is a bit dangerous," finally agreed Dyer, "and probably if the producers had to do the flying they wouldn't kick about paying extra for our work.

"Only once did I ever have the big boss with me," continued Dyer, "and that was a funny one. I was going to shoot some stuff over the site of the coming Boulder Dam for a man who wanted the shots for commercial purposes. We took off from Needles and flew about our business. It was a nice day and we did a lot of work. But we got a late start in the afternoon.

"Darkness suddenly started falling fast and we turned and headed for home. But you know how darkness falls when it starts. Well, we did some plain and fancy flying in the dark and finally sighted Needles in the distance. I admit I was a bit nervous, for I wondered how the pilot was going to land. The big boss was along and he was wriggling all over the place. But he kept quiet.

"Finally the pilot circled Needles several times and then started down. For the life of me I couldn't tell where he was heading, for there were no floodlights and fine landing fields in those days. But, I thought, 'Here goes nothing' as we started for the ground. I looked over the edge of the plane and could see nothing but what looked like a lot of white spots toward which we were landing.

"A few moments later we landed, beautifully. And then I found out what the white spots were. They were tombstones. You see, the pilot had recalled that there was a nice flat field by the side of a cemetery at Needles. He spotted the white tombstones and, guided by them, hit the right field and we all breathed safely again. I wonder what would have happened if he had misjudged, or if some of the tombstones had been of that dark slate."

Harry Perry is another air expert. For nearly two years he has been chief cinematographer, directing the photographic end of Howard Hughes' great air spectacle, "Hell's Angels." During that time he has had as many as twenty-three camera mounts for air work. But to talk with him you would think he was just an on-looker. Quiet, reserved, shy, this man has been in charge of some of the most spectacular air photography ever made.

"Steene and Dyer and Teurs and the other boys are the ones who have done the real work," explained Perry. He failed to state that there was scarcely a day that he was not in the air himself riding the tail of some ship in a thrilling air battle.

"These boys who specialize in air photography deserve a lot of credit," declared Perry. "I mean the ones like Dyer and Teurs and like Steene was before he passed on. They have ridden in some peculiar old crates in past years, and I never heard any of them make a kick about the danger." But he did not say a word about the chances he has taken himself. Didn't say a word about the days during the shooting of "Hell's angels" when more than a score of ships were in the air engaged in mock aerial combat as dangerous as any of war days when, darting in and about this maze of planes, were a dozen or more ships in which rode cameramen "on the tails" of every ship in the mock fray. It requires iron nerve to dash about among a flock of ships with an accident impending at any moment.

Perry didn't tell us that he put in more than 150 hours in the air himself on this picture. He didn't tell us that he went up first each morning to see what flying and photographic conditions were like.

And Perry did the same thing in "Wings," which was photographed under his cinematographic direction. He did finally tell us about being fastened in the rigging of a captive balloon, high in the air, so he could make close-ups of the actors in the basket.

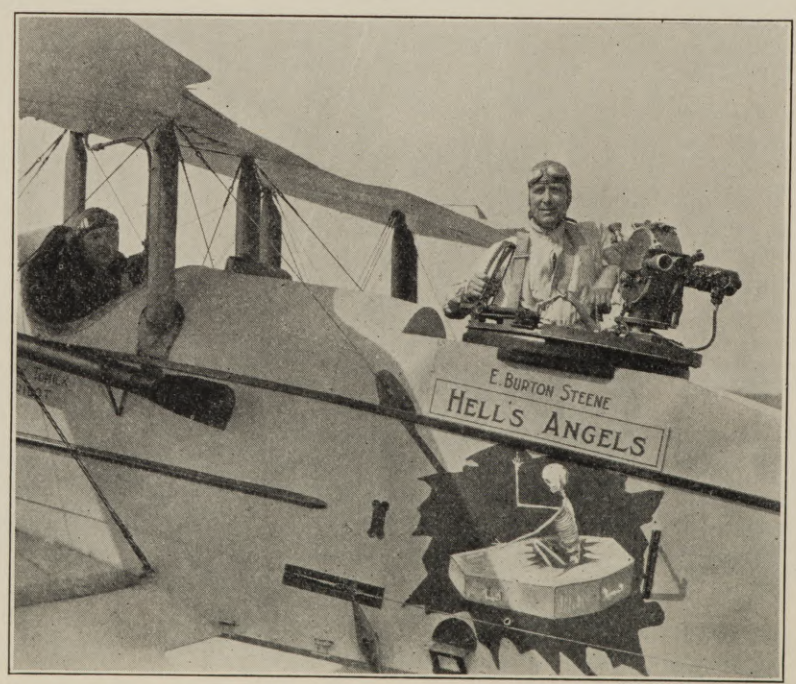
Then, there is Alvin Knechtel. "Al," as he is better known in picture circles, flies his own ship. Of course he cannot fly and shoot at the same time. But he dashes back and forth through the skies every chance he gets and has figured out many a knotty aerial problem while so doing. And when he has to shoot in the air he is perfectly at home. It was Knechtel who gave us the marvelous air photography in "Lilac Time." But "Al," like the others, doesn't like to talk about his air feats.

Al didn't reveal the fact that when he was "shooting" the picture "Lilac Time" he had a dual control plane and always flew it himself until he had it in position for his shot, when he would signal for his pilot to take it while he got a "shot" few men could get unless they flew their own.

If his pilot got out of position Al would calmly grab the stick, swing the ship back where he could get the best results and start shooting again. But, you never hear him talking about his work. He loves flying and will talk about that.

Billy Teurs is another A. S. C. member who helps put the air thrills on the screen. He and his Akeley and a plane are rarely seen apart.

Not only do the air specialists take to the clouds, but the other boys repeatedly are called on for aerial work. And, anyone who has ever flown knows that to hop into a plane when you are not accustomed to it and forget all about the attendant danger while you think of pictorial art, calls for nerve. But they are doing it all the time.



The late E. Burton Steene, as he used to appear ready for the daily jaunt into the air.

Clyde De Vinna was shooting on a picture in which a captive balloon figured. He had to make certain shots from the basket on the balloon. They didn't turn out so well. The next day found De Vinna hanging thirty feet beneath the basket. He had fixed up some ropes and a board. On the board was Clyde with his camera cranking away for all he was worth while the tiny platform swayed as the balloon yawed. At Mitchell Field, Arthur Edison some

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On Tinted Film for Sound Positives

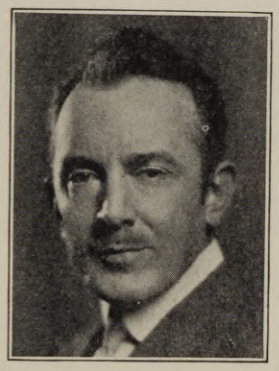
New Process Devised Whereby Tinted Positives May Be Used for Talkies, and the Moonlight May Be Turned On When Wanted

By Loyd A. Jones

[This article is the first part of a paper presented at the Spring meeting of the S. M. P. E., New York City, May 6-9, 1929. The second part will appear in the August issue of this magazine. This paper is also Communication No. 393 from the Kodak Research Laboratories.—Editor's Note.]

POSITIVE motion picture film on tinted support has been available for many years. It has been used extensively, in fact during some periods within the past few years eighty to ninety per cent of the total production has been printed on tinted positive film.

There is little doubt that the employment of material which imparts a pleasing and variable color to the screen adds to the beauty of the production, breaks the monotony of looking for long periods at a plain black and white picture, and softens harsh outlines which otherwise may produce unpleasant impressions. But of much greater importance than these rather incidental aesthetic contributions of color is its great potential power to enhance, by either objective or subjective association, the emotional significance of the scene with which it is associated.



Loyd A. Jones

It must be admitted that the language of color, the more or less precise evaluation of the various hues, tints, and shades, is, at present, in a very rudimentary stage of evolution. Correlations are in many cases subconsciously felt without being consciously defined. It is entirely possible, and in fact probable, that careful study and experimentation may lead to the development of this language or symbolism into a powerful emotional tool in the hands of the master motion picture dramatist.

Recent scientific advances have made possible the reproduction of sound along with the motion picture, the sound record, consisting of a series of photographic images varying either in density or width, being carried on the edge of the positive film band. Although this has added enormous possibilities to the dramatic power of the motion picture, it has made it impossible to continue the use of the tinted positive film which has been employed during past years. The recorded sound is reproduced by the action of light which passes through the record on the positive film and excites a photo-electric cell. The majority of dyes used in making these tinted bases absorb strongly those wave-lengths of radiation to which the photo-electric cell is most sensitive. Hence the response of the cell is so reduced in magnitude that high amplification of the photo-electric currents is required to obtain sufficient volume of sound.

This high amplification increases unduly the inherent cell noises and microphonic disturbances in the amplifier so that the reproduced sound is of intolerably poor quality. As a result, the use of tinted film has been entirely discontinued in the production of positives carrying a photographic sound record. There is little doubt that this absence of color from the screen constitutes a serious impairment of the beauty and dramatic power of the screen production. It is desirable, therefore, that a means be found for producing a tinted positive film which, when used in making sound positives, will not interfere with the satisfactory reproduction of the sound record carried thereon.

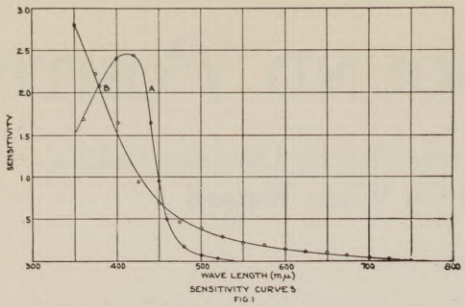
This problem can be solved provided coloring materials can be found which, while absorbing a relatively small amount of that radiation to which the photo-electric cell is most sensitive, will produce, by selectively absorbing the radiation to which the eye is sensitive, colors or tints of the desired hue and brilliance. These dyes, or carefully determined combination of dyes, can be applied to the film base in the usual manner and thus enable the manufacturer to offer a product at no greater cost than the regular clear base positive film.

Another solution of the problem lies in applying the tinting dyes to the film band in such a manner as to leave untinted a narrow strip of proper dimensions and positions on the film band. The sound record can then be printed on this uncolored area and the sound will be satisfactorily reproduced without interference of the tinting material. Unfortunately this method involves a greater cost of manufacture since the tinting dyes must be applied to the individual 35 mm. strip after the base has been emulsion coated and cut into narrow widths. It is obvious that technically this represents the most satisfactory solution. This was recognized by us some considerable time ago and applications were made for patents to cover the idea. Methods and machines for accomplishing this have been devised which give very satisfactory results and it is probable that this material will be available in the near future.

The first solution suggested, namely, the use of dyes or other coloring materials applied over the entire area of the film and so adjusted spectrophotometrically as to transmit freely the radiation to which the photo-electric cell is sensitive, seemed worth further study and after a rather lengthy series of experiments a number of satisfactory tints have been obtained. These represent the entire gamut of hue and, in our opinion, are of the most satisfactory depth or color saturation for use in applying color to the motion picture screen.

In approaching the problem of selecting dyes for this purpose it is necessary, first of all, to determine just what wave-lengths of radiation most strongly excite the photo-electric cell with which the tinted material is to be used. It is necessary, therefore, to determine the spectral sensitivity of such cells. Photo-electric cells may be made by using any one of several different materials, such as potassium, caesium, sodium, and other alkali metals. These may be of either the evacuated or the gas-filled type. The spectral sensitivity depends upon many factors and as a result cells differing enormously in spectral sensitivity are available. To the best of our knowledge, however, there are only two types of cells used extensively in commercial installations for the photographic reproduction of sound. One of these, manufactured by the Western Electric Company and used in the equipment installed by the Electrical Research Products Incorporated, is of the potassium gas-filled type. The other, used in the equipment installed by the Radio Corporation of America, is of the caesium type.

In Fig. 1 are shown the spectral sensitivity curves of these two cells, curve A being that for a potassium and curve B that for a caesium cell. The ordinates of these curves are proportional to the photo-electric currents generated when excited by equal amounts of energy of



Spectral sensitivity curves for potassium gas-filled type photo-electric cell (A), and for caesium type photo-electric cell (B).

the wave-length as indicated by the abscissa values. The proportionality constant used in plotting these curves is not the same for the two cells and hence these curves cannot be interpreted as indicative of the relative total sensitivities of the two cells. They do show, however, the way in which sensitivity varies with wave-length and this is the information in which we are particularly interested at present. The monochromatic radiation used in the determination of these sensitivity functions was of high spectral purity, being obtained by using two monochromatic illuminators operated in tandem so as to effectively eliminate all scattered radiation. The photo-electric current generated was measured with a high-sensitivity galvanometer. The amount of energy incident upon the photo-electric cell was measured by means of the thermopile and high-sensitivity galvanometer.

Since the thermo-electric current is directly proportional to the energy incident upon the thermopile (regardless of wave-length) it follows that the sensitivity of the photo-electric cell, defined in terms of the photo-electric current per unit of energy, is directly proportional to the ratio of the photo-electric current to the thermo-electric current, P_c/T_c. Every precaution was taken to eliminate all possible errors and it is felt that the curves in Fig. 1 represent with high precision the sensitivity of the cells in question. The author is indebted to Dr. Otto Sandvik of these laboratories for these data.

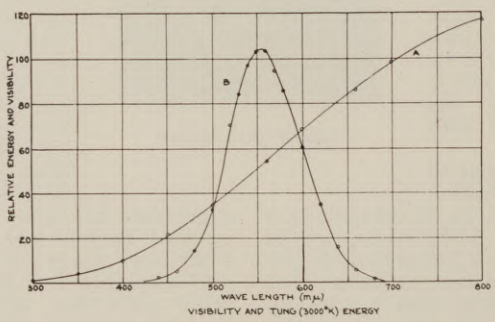
The curves in Fig. 1 show the relative magnitude of the photo-electric currents resulting from the action of equal amounts of energy of different wave-lengths. In practice, the photo-electric cell is excited by an incandescent tungsten lamp which does not emit equal amounts of energy at all wave-lengths. To obtain the effective spectral response curve it is necessary to know the spectral distribution of energy in the radiation emitted by the incandescent tungsten lamp. This depends upon the temperature at which the filament is operated. In commercial sound reproducing installations this is approximately 3000°K. In Fig. 2, curve A shows the relative intensity of the radiation emitted at different wave-lengths for this source. It will be noted that relatively little energy is emitted in the short wave-length region to which the photo-electric cells are most sensitive, while relatively large amounts of radiation are emitted at longer wave-lengths.

In Fig. 3 are shown the effective spectral response curves for each of the two cells when used with a tungsten lamp operating at 3000°K. The ordinates of these curves are determined by multiplying, at each wave-length, the ordinate of the sensitivity curve (see Fig. 1) by that of the tungsten energy curve, Fig. 2.

It will be noted that the response curve of the potassium cell (A, Fig. 3) has a relatively high sharp maximum at wave-length 425 $m\mu$. It decreases rapidly for both longer and shorter wave-lengths reaching a value of 10 per cent of the maximum at 490 $m\mu$ on the one hand and 340 $m\mu$ (estimated) on the other. The effective response curve for the caesium cell is shown in Fig. 3, curve B, and is of a broad flat type having a maximum at 420 $m\mu$. For longer wave-lengths the response decreases gradually reaching a value which is 10 per cent of the maximum at approximately 750 $m\mu$. The response at 700 $m\mu$, the long wave-length limit of the visible spectrum, is 35 per cent of that at the maximum. It will be noted that the maximum of response is at practically the same wave-length for these two cells, although the caesium cell has a much broader spectral sensitivity than the potassium cell. It is evident from a consideration of these response curves that any coloring material which absorbs strongly in the region between 400 and 500 $m\mu$ will have a relatively high density if measured in terms of this photo-electric cell and a tungsten lamp.

These wave-lengths impinging on the retina give rise to the colors described quantitatively as violets and blues and if these wave-lengths are absorbed from white light the remainder produces a yellow color. Yellow dyes in general therefore have high photo-electric densities. This is true qualitatively for both cells although it applies with much greater force in case of the potassium cell which has a relatively narrow sensitivity band in the short wave region. As a result of the difference in shape of the response curves, certain colors, such as yellows, give relatively lower photo-electric densities when measured with the caesium cell than when this quantity is determined by means of the potassium cell.

The eye is a receptor of the synthetic type and does not analyze a heterogeneous radiation into its component parts. The sensation arising from the impingement of heterogeneous radiation on the retina has a single hue characteristic and identical sensations of hue may be excited by heterogeneous radiations differing very widely in actual spectral compositions as determined spectrophotometrically. It is evident, therefore, that there is a possibility of obtaining a desired color by several different types of spectral absorption curves. Since the radiation required to actuate the photo-electric cell is localized in a very definite wave-length region, it follows that course to be pursued in the solution of the problem in hand is to select absorbing materials which most eeffectively transmit thes wave-lengths and at the same time most completely absorb those wave-lengths which, when substracted from white light, operate most efficiently toward the production of a color having the desired hue and saturation characteristics.



Visibility and tungsten enegry (3000°K): A, relative energy of radiation from tungsten at 3000°K. B, relative visibility of radiation from the same source.

In order to proceed most directly and logically in this direction, knowledge of the visibility of radiation is of considerable importance. This knowledge is of assistance in deciding just what particular type of selective absorption will most efficiently produce a desired color and, at the same time, most efficiently transmit those wave-lengths which are required to excite a photo-electric cell. Curve B in Fig. 2 shows this visibility function, the ordinates being proportional to the magnitude of the

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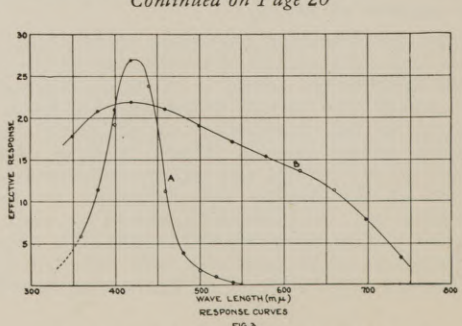

Effective spectral response of potassium cell (A) and caesium cell (B) when used with a tungsten lamp operating at 3000°K.

BETTER MODELLING LIGHTS

A Timely Discussion of Incandescent Lighting Equipment Now Generally In Use In the Making of Sound Pictures by an Expert with an International Reputation.

By R. E. FARNUM
Engineering Dept., National Lamp Works, G. E. Co.

High efficiency incandescent lamp equipments used for general lighting purposes are now well established and known to the studio staffs generally. They result in a marked improvement in the amount of light available from a given lamp wattage. These units direct more than 40 per cent of the light output of the lamp into areas where it is useful as compared to 15 per cent with the older types in which no effort was made to accurately control the light. The principles underlying the design of the more efficient types have been discussed in a previous communication.

Modelling lighting equipment is usually required to produce illumination of from two to four times and not infrequently ten times the intensities from the general lighting equipment. Since the illumination values for general lighting usually range from 200 to 500 foot-candles, the modelling equipment may at times be required to produce intensities as high as 2000 foot-candles or even more. The area over which this higher intensity is necessary is limited so that lighting equipment which is capable of projecting a beam of light with a spread of 8 to 30 degrees is most satisfactory.

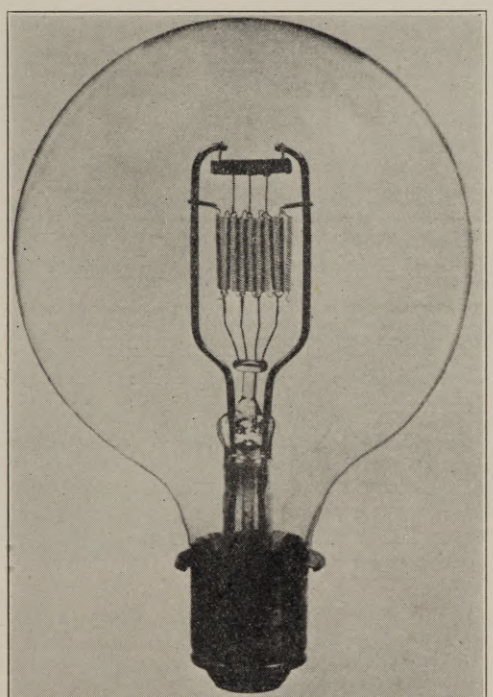

Fig. 4 Images of coils meshed between filament segements

Both lens and reflector spotlights are employed for this service and each type has its own particular advantages and disadvantages.

The beam spread of the lens spotlight is capable of continuous adjustment through the required angles and the illuminated area is always satisfactorily uniform in intensity. Furthermore, all of the light emitted is confined to the beam and there is no objectionable "spill." Unfortunately, the amount of light intercepted by the condensing lenses, representing the best present designs, is only about 8 per cent of the light output of the lamp. With a spherical mirrored reflector placed behind the lamp to redirect additional light into the beam, this is increased to 12 per cent, an amount of light which limits the application of the lens spot to the shortest throws and "close-ups." Reflector spots which incorporate an accurately made paraboloidal mirror with a focal length from 33 to 40 per cent of the mirror diameter, intercept solid angles of light up to approximately 140 degrees. Thus the volume of light in the beam of the reflector spot is of the order of four times that of the lens spot and its field of usefulness in studio service is much greater.

For beam spreads beyond approximately 16 degrees the illuminated area from a reflector spot becomes increasingly non-uniform and the use of light controlling cover glasses becomes necessary. A single accurately made door, giving an added beam divergence of 10 degrees both vertically and horizontally, meets the most common demands and makes it necessary for the studio to have available only a single type of spreading door.

The light from the front of the lamp issues through a wide angle and if uncontrolled this "spill" light may interfere with the effectiveness of the unit. Baffles are often used to screen this extraneous light from the upper walls of the set. Spill shields incorporated in the lamp housing are not so efficient since they absorb light that might otherwise be useful and at the wider beam spreads much of the light in the useful beam is intercepted by the shields. A very satisfactory method of not only eliminating the spill light but of strengthening the main beam is to use a spherical mirrored reflector placed on the front side of the lamp. For the 2000-watt G-48 bulb spotlight lamp so commonly employed for medium range spot and back lighting, a spherical mirror having a diameter of 6¾ inches and an outside radius of curvature of 3¾ inches should be used. The spill light is, of course, completely eliminated and furthermore the intensity in the main beam is increased about 30 per cent for all spreads from 8 to 30 degrees. Sometimes people have asked whether such a spherical mirror will not give the

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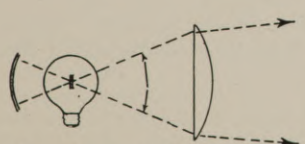


Fig. 1-Plane angle of light intercepted by lens spot

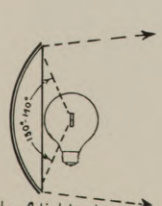


Fig. 2-Plane angle of light intercepted by reflector spot.

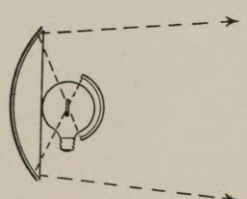


Fig. 3-The smaller spherical mirror adds about 30 percent to the light in the beam.

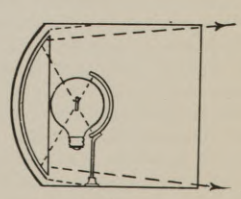
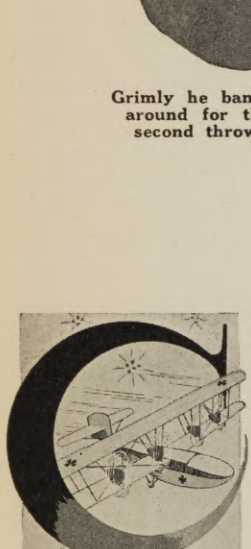


Fig. 5-Old type unit wastes much of the light when beam is spread

ACCOMPLISHMENT

Grimly he banked around for the second throw.



COLONEL WYNDAM STANDISH, commanding R. A. F. Pursuit Squadron 490, regarded with something akin to respect the operations of a German spy at the Croydon Airdrome who was sending much information to Germany and was leaving no clues as to his own identity. The Colonel felt sure it was only one spy from the way the espionage operated. Had there been a group of spies, some one would have made a mistake, thereby leaving the one clue for the colonel or the I. D. counter-espionage men to pick up a chain of evidence and work out a solution to the mystery. As matters stood, the British I. D. operatives and the air forces were baffled, and the spy was becoming more audacious than ever.

Only last night a Zeppelin had come over and bombarded Croydon while all pursuit plans were thirty kilometers away, waiting for the Zep to raid where it had been reported. Two nights before, a flight of 4-motored Lizenz Bombers had bombarded the munitions warehouses at Suydan-on-the-Thames, just as a merchantship was loading for a trip across the Channel. All R. A. F. pursuit planes had been sent hell-bent to fight off the raiders who were expected over London. There were numerous other incidents equally as tragic and as well executed by the spy within the past month. The German raids, which had been executed with such precision without a shot being fired by England, and the fact that nobody was arrested or even suspected, proved conclusively that only one man, a master, was planning and executing the coups.

Colonel Standish scowled. He knew that if this did not stop, he, an old veteran, would be demoted and sent to some obscure training camp to drill recruits, He muttered wrathfully at his report-littered desk and glowered fiercely as a clerk entered the office.

"Sir, Captain Wilton is back," the clerk announced.

"Send him in," the colonel snapped, laying aside his cigarette butt, and the wrathful glitter in his eyes changed to a glow anticipating good news.

He surveyed the six-feet-two, blond, athletic aviator who had entered, snapped to a rigid salute, and said:

"Mornin', suh!"

"Good morning, captain," the colonel returned the salute, "you Americans speak with a slow drawl, but if you are all such hellions for action as I know you to be, the Kaiser will soon be peeling spuds for our private soldiers. Now, what's the good word, captain?"

"None, suh," came the solemn reply of Captain Delavan Wilton, late of Texas and at present ace pilot of the 490th Pursuit Squadron, R. A. F., "that damn spy is as free as the air we breathe."

The colonel's face began to take on the purple of rage and disappointment.

"Ye gods!" he groaned, on the verge of an apopletic fit. "Hi say, Wilton, 'aven't you found out hanything?"

The colonel got his "h's" misplaced when laboring under great stress.

"Nuthin', suh," was the drawling reply, "but buck up, suh, that Heinie hasn't got us roped an' hawg-tied yet!"

"Hoh, well," the colonel muttered philosophically, after a moment, "hi'll be pensioned in a few years hanyway."

"Eh?"

"Nothing, Wilton. Er—Sheila phoned I should invite you to tiffin—com-on, time to go now. Let's forget this bloody war for an hour."

Wilton grinned.

"Darling Sheila," he said in a low, fond tone as he assisted the colonel into his topcoat, "she's the kind of woman who makes this damned war bearable."

"Yes, Wilton," the colonel answered, after they were seated in the staff car, "but she worries me. When her mother died I had to raise her the best I knew. Now she's twenty and needs other companions besides a rough-

A Story of Love, Movies, Romance, Aviation and Adventure

By A. Kinney Griffith

Illustrations by John Corydon Hill

neck old father. And I don't like her associates over at the motion picture studio. If I am ordered to France she'll be . . . ."

"She once told me she would like to join the Waacs," Wilton interrupted.

"No, sir! I won't 'ave it, Wilton, she's not strong enough," the colonel replied vehemently. And so they argued until the car slid to a halt in front of the Standish residence.

TIFFIN was served at ne in the afternoon while Colonel Standish was stationed at Croydon. There were no servants, so Sheila Standish, a beautiful, blue-eyed girl with the slenderness of a wild goldenrod, had prepared an excellent repast. She served the food and ate daintily, for the most part remaining silent, listening to the conversation between her father and the visitor.

She was always glad to have this tall American captain at the house, but at times he was such a terrible bore with his everlasting talk of war, army, airplanes, spies—even now, over the second cup of tea, she felt like screaming with the monotony of the conversation. Why couldn't Del Wilton be like Sir Charon Haydon-Winnington?

She was fond of Del Wilton, but—well, differently. Of course, she would always want Del somewhere near. She realized that as she stole a glance at him sitting opposite her. Good and strong, Del was. Too good and strong, she thought, watching him. He wasn't—well, he wasn't romantic like Sir Charon. Sir Charon had dark eyes, eyes that sometimes had deep fires in them. He could say things that did not mean just what the words said because of the way he uttered them. She never would entirely understand Sir Charon Haydon-Winnington.

But Del Wilton? She smiled that the thought. Dear old Del, always the same; gentle in a wholesome, bear-like way, a little pathetic in the completeness of his adoration for her. No, there was no mystery about Del.

Still, she regretted having promised Sir Charon to go riding this afternoon. But it was her dad's fault, because he kept her penned up so much. And Del had no strings on her. He'd been proposing regularly for a year, but always she had smile, patted his arm, and said, "sometime, maybe after the war." No, Del had no strings on her. Her father could entertain him—they'd be going back to the office soon, anyway. Having worked herself into this frame of mind, she found courage to announce her program. She got to her feet a little aggressively.

"I must change," she said, interrupting their conversation, and, when both had turned their eyes upon her, she continued lamely, "I—I am going out."

The coloned looked his astonishment. "Where?" he asked. "You're not working on a picture now."

"Riding with Sir Charon Haydon-Winnington," she replied.

Down it went like a flaming rocket.

Colonel Standish's tilted chair hit the floor with a bang. "Strike me pink! Who is this Sir Watzisname?" he demanded, the usual purple mounting to his temples.

She had expected something like this. "He's a very dear and distinguished friend of mine," she told him, her head high, nostrils aquiver, eyes glittering.

"Yair? Why hain't I met him—never 'en hear o' him." The colonel's grammar was again haywire.

But there was Standish blood in Sheila, too. "Because I haven't come to the point where I want to confess that I am only a commoner's daughter," she flared, and the emphasis on the word made both men see red.

"Well, gor-blimey—" her father exploded, but Del put out a strong hand and forced him back into his chair. Still gripping the colonel's arm, Del Wilton turned to Sheila, who stood trembling, angrily defiant.

"Wait a minute, honey," he began conciliatingly. "Who is this bloke, that meeting a couple o' commoners is goin' to mess him all up?" He strove to put banter into his tone, but the edge of resentment was there, and Sheila sensed it.

"He's of the diplomatic corps," she answered, turning her angry gaze full on Del.

"Well," he said, "he shore has used diplomacy with you-all."

Colonel Standish, his flare of temper passed, chuckled. That was a mistake, because you could not chuckle at Sheila Standish's expense and get away with it.

"Which is more than a soldier will ever do!" she snapped and with head up, haughtily left the room.

The two men sat in silence, avoiding each other's gaze. Presently they heard her talk with someone in the hall, winced as the door slammed behind her; then, moved by a single impulse, hurried to the front windows in time to see her take her seat in a smart, blue roadster beside a civilian in white knickerbockers, and a grey tweed coat.

WHERE to, Ma Cherie?" Sir Charon asked as they rolled away from the curb.

Sheila liked that "Ma Cherie." It was so typical of Sir Charon, and it sounded so exotic.

"Let's drive over Berkshire way," she suggested, "they're shooting scenes in one of 'Baby Bab's' serial pictures there, and I want a lot of this fresh air and sunshine."

Out beyond Wimbledon, Sir Charon turned the roadster off the main highway, guiding it slowly through meticulously groomed estates to the wilder, more beautiful farm land still farther from the beaten highway. They were idling along a level stretch within sight of the picture company's location when Sheila grasped his arm exclaiming ecstatically: "Look, Sir Charon! That goldenrod! Isn't it gorgeous! Please stop so I can get some!"

For a while they gathered goldenrod, Sheila pausing occasionally to exclaim delightedly over the length of some, or the fullness of that one or the deep yellow of the other one. They returned to the car where Sheila arranged her flowers. While she sat literally buried in them, Sir Charon slipped an arm around her.

" 'Twill be you and I pretty soon, my sweet," he whispered. She had an uneasy feeling that he was suggesting more than the words implied, but that was Sir Charon's way. She was aware, too, that it was the first time he had called her "my sweet." Somehow, she did not like the expression. Although it was not as thrillingly romantic as she had pictured Sir Charon's proposal would be, she relaxed in his embrace ready to yield to a kiss, but the wild fire in his eyes that once had seemed so alluring, actually repelled her. He was looking into her, through her, seeing things he had no right to see. She pushed him away.

"Not yet, Sir Charon," she said. "I—I cannot promise —but I won't say no. I mean, I won't say anything. Oh—please, let's go back now—Here . . . ."

With a few deft movements of her slim hands, she braided several slender stems of the goldenrod into a chain, and reaching for his right lapel, entwined the goldenrod in the buttonhole.

"What's that, my sweet?" he asked, trying to grasp her fingers.

She eluded him. "A goldenrod chain," she laughed. "I braided it especially for you. Wear it, it will bring you luck."

"Will it bring me what I want most?" he asked.

"One never knows," she smiled, "let's go now."

He turned to the wheel, sighing; a sigh that was all even Sheila could ask for. "All right, Ma Cherie," he said tenderly and started the motor.

"Cripes!" came an enthusiastic voice, a short distance away. "That certainly was a good shot! I got it all from the moment you entered the car. It was a most natural picture, Miss Sheila!"

Sheila and Sir Charon looked up in astonishment to behold a cameraman of the Baby Bab company picking up his camera and walk off back to the company. "I'll bring you the film in a few days," he shouted over his shoulder.

"Hell!" Sir Charon snapped. "That fool took a picture of us! I'll get that back!" His eyes glowed murderously and he started to get out of the car.

"No, please!" Sheila said, and grasped his arm. "Let him go. It will be scads of fun to see ourselves that way—no acting—it will be really natural!"

"Well, all right," he grumbled, "if you don't mind. It may help you at that, eh?" With that he started the car. They drove over the route she had suggested, stopped at an Inn for dinner, and had several dances. For the last hour he had seemed nervous, anxious to return. They scarcely spoke as he pushed the powerful roadster over the road.

It was after midnight when they arrived at Sheila's home. Before she alighted, she leaned over quickly, and ever so slightly, brushed her lips gainst Sir Charon's cheek. Then nimbly, she stepped from the car, and avoided his passionate gesture to embrace her.

"Good night," she called, and skipped up the steps. Quietly she tip-toed to her room where a few minutes later she sat on her bed, knees under chin, a very alluring huddle of silk and soft body.

What to do, now? Sir Charon had asked her to marry him—Suddenly, despite the warm summer night, her room seemed chill. He asked her to marry him? She hid her face in her robe, shamed by the thing this thought had suggested. Of course he had! But, every time Del had proposed there had always been talk of "marry" and "wife" and "home" and the "States"—but, well Sir Charon was so different. And those eyes of his! They were so cabalistic, or were they just eyes that clothes could not keep out? She wondered, and wondering slept.

AT DAWN someone called her from the Croydon Hospital to inform her in professionally calm tones that her father was there—dead! The third time that calm voice repeated the message she believed it, and fainted.

Captain Del Wilton came at noon. But this was not the lover who had pleaded so abjectly for her affection. This was a stranger who stood stiffly across the room. A stranger with steel-blue eyes and a granite-like face who spoke in cold, crisp tones:

"We don't know what happened, yet," he informed her. "I left he-re shortly after you-all yesterday."

Sheila, face in her hands, wept convulsively at the recollection of that stormy parting, while Del waited for her to raise her eyes. When her sobs ceased he continued.

"Some time after I left, Martin Lewis, an I.D. man, came. That we know, and we know, too, that Mart is on a slab at the hospital with a chest full o' bullet holes. They found him back of the wireless station at the airdrome. The wireless operator was found dead at his post with a knife in his back—and a Zeppelin bombarded the docks at Sheerness while all our pursuit planes were ordered to be ready for a raid on London. Your father was found shot from behind while at the controls of his plane. The moter was runnin' ready to take-off."

Sheila sobbed hysterically.

"The I. D. men believe," Del continued, "that Mart found a clue and summoned your father, and that they tried to ambush the spy at the wireless station or the hangars. They probably reckoned the two of them alone would have better chances of catchin' the spy than if they got a squad of soldiers. It was a brave thing to do—them not knowin' what to expect — but then, your father was the bravest man I ever knew."

Sheila, sensing rebuke in this, bowed her head in grief. If she could have yesterday afternoon to live over again!

"I'll take care o' everythin'," Del said hesitantly at the door. "If you'll have a list of relatives an' things ready tonight, I'll come over an' take care o' that, too."

Sheila raised her head and stared at Del—the stranger with the steel-blue eyes and granite-like face. And she needed the old Del so! She spoke quickly!

"Del," it was a husky, broken whisper, "if you—if you can find the man who killed dad, I'll marry you the moment you say the word."

Before he answered, she realized she had offered herself to a stranger with grim eyes in a grimmer face, a stranger who didn't want her!

"I don't want you-all to marry me," Del said crisply, and went out. His clenched fist driven to her mouth would have hurt less. Yet, she felt no anger. Her spirit and courage were gone. The room whirled and she sank back into her chair.

Directly after the funeral services Del sought Sheila out alone. She swayed toward him because she needed him, increasingly with every fleeting minute. She almost raised her arms to him. But he merely put forth a hand

to grasp her elbow, an impersonal hand such as he would have extended to any woman who required assistance.

"I'll be goin' now," he said. "But I'll always be on tap in case you-all need me." He paused, then, like a sullen boy, continued: "that is—if you-all should re-quire the help o' a commoner."

She tried to speak, choked, and put forth a hand to stay his going. But Del was gone, and she knew why. He had loved her father; had loved her too, and only two days ago she had humiliated them both, and for a suave dispenser of cheap compliments who had not so much as telephoned her since that evening.

THREE weeks passed. Weeks in which Del Wilton lived in hell. Four consecutive times alarms had come in that the German air fleets were coming to raid, and each time he had led his squadron into the skies to meet the invaders, only to find they had again been tricked. And the raids were becoming more terrific. Everybody, from parliament to peasantry, was howling for vengeance. Yet the war birds and the I. D. men were baffled, handicapped, unable to do a thing to end the enemy raids.

Then, one night while waiting for the inevitable alarm, Del Wilton deliberately disobeyed orders when it came.

"Zeppelins reported over Kolkestone," said an official voice over the telephone. "You will take off at once to intercept them—and bring them down—at all costs!"

Del snapped into action, bellowed orders, and in a few minutes the airdrome seethed with activity. Eight sleek Bristol Fighter planes were trundled from their hangars and their big Rolls Royce motors revved up. A few more minutes, then Del gave the signal and the eight swift fighting planes roared down the runway and swept into the night.

But, instead of going south as he had been ordered, Del lead his squadron in a wide circling climb, then turned east. At 5000 meters which was high above the drifting clouds, he cruised in a wide circle. What, he heasoned, would be the sense of the Heinies bombing Folkestone—an unimportant seaport—when, by flying twenty kilometers farther, they could bombard London itself.

While cruising, Del kept his eyes on the world-wide heavens and as the moments passed by, he began to wonder if his hunch would bear fruit after all. He could visualize what would happen to him if he failed after his direct disobedience of orders.

Then suddenly, out of the star-lit southern sky came two big, blunt noses, and they were coming fast!

For only a second he stood there

"Two o'them! Just as I reckoned, by God, an' headed directly for London. He yelled those words aloud to himself. He fired a Verys flash, a signal to his squadron mates, then with motors roaring wide open the eight Bristols, with Del in the van, darted head-on to meet the gigantic Zeppelins.

Del was first to zoom and shoot. The next few minutes were as a nightmare to both English and German airmen. Searchlight rays sweeping from the control cabins of the Zeppelins created a ghostly, weird scene, as the mighty air monsters fought off the fire-spitting planes. Those Bristol Fighters were swarming around the Zeps like a flock of chicken hawks attacking two wild eagles.

The twin Vickers machine guns firing through the propeller arcs of the airplanes answered bullet for bullet from the gun tunnels of the Zeppelins. Sizzling streams of bullets flashed everywhere and Del was in the thick of the furious mixup. He flew and shot like a demon of the air. It seemed here was his one chance to purge his body of all the vengeance therein contained; at the same time put an end to the diabolical raids on England.

When the top-side tunnels of the Zeps had been strafed clear of machine gunners by his squadron mates, Del swooped in to drop his first Rankin Dart. His was the only plane equipped with these dangerous little bombs, so upon him fell the burden and danger of maneuvering close enough to the sky monsters in order to drop the darts upon the big hulls.

He made one lightning-like zoom and dropped the first dart. It hit and its needle-like point punctured the big Zep square. There the dart wavered and its fuse began to glow. Del headed full speed away from the Zeppelin. And well that he did for suddenly the Zep exploded with such a crash and concussion that the world seemed rent asunder.

Down it went like a flaming comet, followed a moment later by a Bristol which had been so near that the explosion tore it apart. Back Del came, like a hungry wolf, and again he zoomed at the next Zeppelin. Again he threw a Rankin Dart, and missed. Grimly, he banked around for the second throw, and this time was successful.

Again a needle-like dart punctured the big Zep. Then the glowing fuse and an explosion. At a safe distance Del banked and watched the downward plunge of the shattered monster. It was a fearful sight. Yet somehow Del felt a strange surge of elation. He felt he had ended the slaughter of innocent and defenseless citizens for once and forever. He felt he had avenged his friend Colonel Wyndam Standish.

He leveled off and scanned the dark sky for his comrades. He fired a Verys. Only three planes answered the summons. The others had "gone west."

THE next morning, Del Wilton was hailed before the commander-in-chief. Generals slapped him on the back and called him hero! In a happy daze he listened to the Marshal's eloquent panegyric and felt the Distinguished Service Cross being pinned to his chest.

Sheila Standish read of the event in army bulletins that day. She, too, was in a daze. Her heart leaped wildly over the honor bestowed upon Del, but the next moment brought the same old feeling of despair. Day in and day out, she had walked from room to room, striving to keep her gaze from those things which had been particularly precious to her father. She found she could not, for every turn brought her eyes to some object that had been doubly dear to the man whose genial, grumbling bass never again would fill the rooms so cluttered with the souvenirs he had gathered from all over the world.

Loneliness, like some evil, unclean thing, stalked beside her with noiseless tread. She turned to the telephone. She would call Sir Charon. It occurred to her then that she could not. He had given her no telephone number. Always he had communicated with her. Until that dreaded day he had called daily.

Twenty-one days of bitter anguish and bitterer self-reproach. If only she could have that day to live over again. If only Del would call. Why hadn't she heard from Sir Charon? Then she did hear from him. She spoke of her father's death.

"Ah, yes, Ma Cherie, a lamentable tragedy," said his voice over the telephone in the tones she loved so well. "Is there any trace of who did it?"

"None," she answered resignedly, "I don't believe we'll ever know."

"Oh, my sweet, that's too bad, indeed," Sir Charon comforted. There was sympathy in his voice. A pause, then: "Can I see you?" His tones were confident and soothing.

Continued on Page 40

As The Editor Sees It

. . . . "And as I walked along
There was no sound,
Save where the wind with long
Low hushes whispered to the ground
A snatch of song.

No thought had I
Save that the day was fair
And fair the sky
And God was everywhere." . . . .

TO THOSE of us who are harried by the hustle and bustle of a hectic struggle for existence, the above line mean much. They, for the moment, carry us to the solemn mountains; to the placid lakes; to the broad green valleys where foam-flecked streams sparkle beneath the summer sun; to spots far from the pettiness we find in the crowded centers, and bring peace, rest, —and make us think of things that sweeten souls so often bitter from the daily buffeting.

Have you ever noticed that men who are constantly in contract with the beauties of nature rarely do the things that are small and mean? Our gangsters and professional gunmen usually are spawn of the gutters of squalid sections of the big cities. Perhaps if more of us were able to meet nature face to face we would find a new philosophy, a philosophy of love, a feeling that God is everywhere, and the world would be a sweeter place; life would lose its bitterness; laughter would take the place of many tears.

Regarding Mental Fare

WITH this issue we start printing fiction in the American Cinematographer. Naturally, we hope our readers will not only like our first story, but will also like the idea of having fiction in a magazine that is primarily a technical publication.

Experience and a study of history teaches us that there are always some individuals who resent anything new; any change in policy. So we expect to hear from some readers who will want to know why fiction in a cinematographic magazine. To those we explain in advance. Our object is to make the American Cinematographer the most interesting magazine in our particular field. To do this we feel that variety of subject matter will be invaluable. To the writer nothing tastes better than fried brook trout—but, if I had to eat said speckled beauties three times a day for a year I would feel like taking a leaf out of Nebuchadnezzar's notebook and go out and graze with a herd of dairy cattle.

And so it is with magazine contents. The average reader, we feel, wants the scientific and technical which has always been the backbone of our magazine. We also feel that many of them will welcome something more. So we shall continue, as always, to emphasize the scientific articles; lead the field with them. But these will be the piece de resistance, feature articles of human interest will be the salad, and fiction will be the dessert. We hope it will be liked.

The Future of Color

WHAT part will color play in the future of motion pictures? That is a question on nearly everyone's lips since the opening of Warner Brothers de luxe attraction "On With the Show." In this picture we see the first sound feature in color, and it has proven effective and beautiful—another milestone in the development of the picture art.

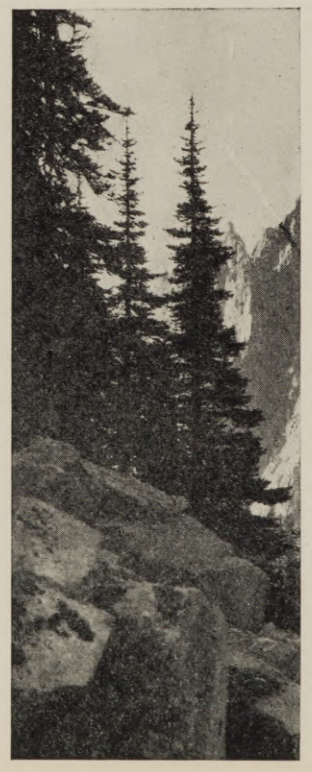
It is not so long ago that Doug Fairbanks gave us our first silent feature in color, "The Black Pirate." That stimulated interest in color, but black and white continued to prevail. However, color sequences followed and most pictures that aspired to greatness, from the point of "production values," had some color injected in sequences that lent themselves to color.

And now "On With the Show" has made its bow as the first all color talkie, and without a doubt color will catch on with a rush that even the most enthusiastic boosters of color never dared to predict. For some time many of those in whose hands the production of the future rests have predicted the all color picture.

Everybody follows a success, and nowhere more so than in the picture business. If a producer makes a successful society drama the others follow; and unless the production powers of picturedom suddenly turn over a new leaf, it looks as though the rush for color will resemble a bargain sale at a department store.

A brief analysis of the vast field of amateur movie makers shows that the country is rapidly becoming "color-minded." Kodacolor and Vitacolor are taking hold among the amateurs in a fashion that proves the public likes to see natural color on its screen.

And now that talking pictures are a reality, color helps carry out the illusion and makes one forget that he is watching a shadow. What the future holds in the way of color is a question no one can answer, but the wind is blowing colorwise.



Glen Kerschner's Cartoon

FEW organizations can boast of a man of such versatility as has Glen Kerschner, the man who drew the cartoon dealing with the Isle of Lost Ships. Glen can wield a clever pen, do a bang-up job as a cinematographer. shoot unusually fine "stills' or paint an excellent picture. His cartoons will be a monthly feature hereafter in The Cinematographer.

Sol Polito, the chief cinematographer on the picture featured in this conth's cartoon, is one of the best known men in the profession. He is a member of the Board of Governors of the American Society of Cinematographers. His most recent pictures include "The Shepherd of the Hills," "Scarlet Seas," "Man of the Moment," "Broadway Babies" and others.

Irvin Willat, the director of the picture has made some wonderful sea pictures and is noted for his ability in this line, as well as his ability to direct any type of picture. Among the outstanding pictures of the seas to his credit are "Behind the Door," "Below the Surface," "Yellow Men and Gold," "Partners of the Tide," "All the Brothers Were Valiant," "On the High Seas," and others.

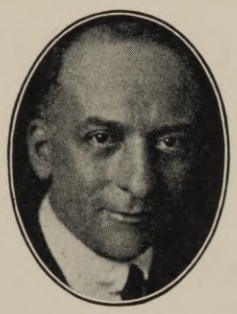
Appreciation

THE increasing flood of letters from amateurs in all sections of the United States congratulating us upon our Amateur Department sends a warm glow through the editorial veins. That the amateurs appreciate an amateur department in a professional's magazine is being evidenced daily by an increase in circulation far beyond the fondest dreams of the board of editors. As in the past issues, we shall endeavor to give our amateur readers articles that will be of real assistance.

A. B. C. OF SOUND PICTURES

By JOSEPH A. DUBRAY, *A. S. C.*

(Fourth Paper)



AFTER the invention of the telephone, Graham Bell visualized and brought into practice the possibility of transmitting sound at a distance without the use of connecting wires and through the agency of light.

Graham ell took advantage of the remarkable property of Selenium to alter its electrical resistance proportionately to the intensity of the light to the influence of which its is submitted.

In order to bring about the necessary alterations in the intensity of a source of light striking what we would call a Selenium Cell in rhythm with pre-determined sound waves, Graham Bell devised an apparatus which he called the **"Photophone."**

This apparatus consisted of an optical system condensing a source of light, natural or artificial, to the back of the vibrating diaphragm of a telephone transmitter. The surface of this transmitter was polished so as to have the high reflective power of a mirror. When the diaphragm was at rest it would be so set as to reflect the light in a desired direction.

The reflected rays were collected by a lens which would force them to follow paths parallel to each other. This beam of parallel rays was made to strike a parabolic concave mirror, the reflecting surface of which would force them to converge at its focal point.

A Selenium Cell was placed at this point.

This cell was constructed of a number of thin brass discs alternated with smaller mica discs. The interstices between the several brass discs, which resulted from the fact that the mica discs were of a smaller diameter, were filled with melted Selenium.

The Selenium cell, or resistance, as we may call it, was made to be part of an electric circuit comprising a telephone receiver and a battery.

When the diaphragm of the transmitting instrument was at rest the rays of light, reflected by the surface of the mirror, would strike the Selenium cell at the maximum of their intensity; but, as soon as the transmitting diaphragm was made to vibrate, the parallelism of the rays of light would be destroyed and due to the change thus brought in the angle of reflection of the rays of light incident upon the parabolic mirror, the degree of concentration of the reflected light striking the Selenium resistance would be altered. This would alter the electrical resistance of the Selenium and the strength of the current flowing in the circuit would thus be submitted to rapid changes in accordance with the vibration of the transmitting diaphragm. The diaphragm of the telephone receiver would in turn vibrate in accordance with the changes of strength thus brought about in the current flowing in the circuit and therefore, in correspondence with the vibration imparted to the receiving diaphragm.

If one some would speak into the receiving apparatus his voice would thus be transmitted at a distance without the need of intervening wires and through the influence of the light rays.

In order to clearly understand the functioning of sound recording and reproducing apparatuses, it is quite necessary to have a fair understanding of the fundamental principles of electricity and electro-magnetism.

Without attempting to enter into an elaborate discussion of electrical and magnetic phenomena we consider quite fitting to acquaint our readers with some of the terms which will appear in the course of these articles and their significance.

It is quite proper to mention here that when reference is made to the "flow" of an electric current, this expression should not be construed to indicate a natural advance or movement forward of the current, but it should be visualized in the sense that the current is the resultant of the motion of an innumerable number of infinitesimally small particles of electricity called "electrons." Some of these electrons are bound to the moleculae of the current conductor and some of them are free to roam around within the moleculae.

The motion or vibration or displacement, as we may call it, of the free electrons is surmised to consist of their discharge from moleculae to moleculae, or atom to atom, under the action of an electro-motive force.

The motion of the bound electrons is construed to be in the form of a temporary small displacement of the electron from its position of equilibrium when the electro-motive force is acting upon it.

The "flow" of an electric current should then be construed not as the actual displacement of something tangible, such as water for example, but as a transmission of movement much in the same manner as we consider the motion of light as the vibration or motion imparted to a particle of ether by another vibrating particle just preceding it.

Whenever "something" is involved in a movement it is possessed with the power of accomplishing an effort which is termed "work." Whenever this "something" has the power to accomplish work it possesses what is called "energy."

"Energy" is termed Potential or Kinetic according if the "something" is immobile or in motion.

A weight, a book for example, or a stone, or a body of any sort, placed upon a table is in a condition of rest and it possesses potential energy. If this body is pushed to the edge of the table sufficiently far as to fall from it, at the very instant at which it begins to fall it acquires kinetic energy.

An electric current in a state of rest, such as when it is stored in a condenser or accumulator, possesses "electro - static energy" which is the electric term corresponding to mechanical potential energy.

If the electric current is in a state of motion, as for example, if it is flowing into a conductor,

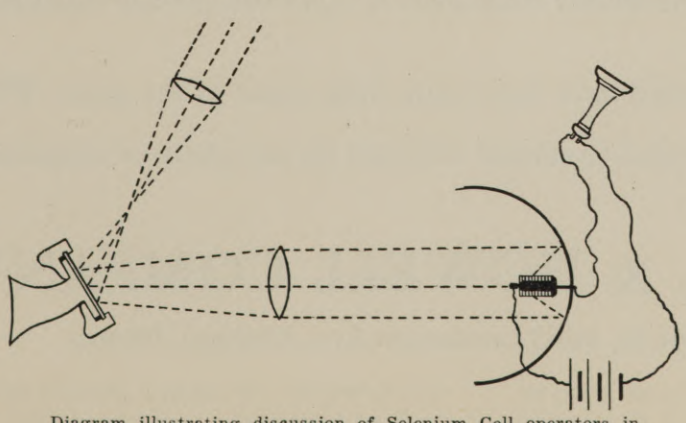


Diagram illustrating discussion of Selenium Cell operators in producing sound.

Continued on Page 25

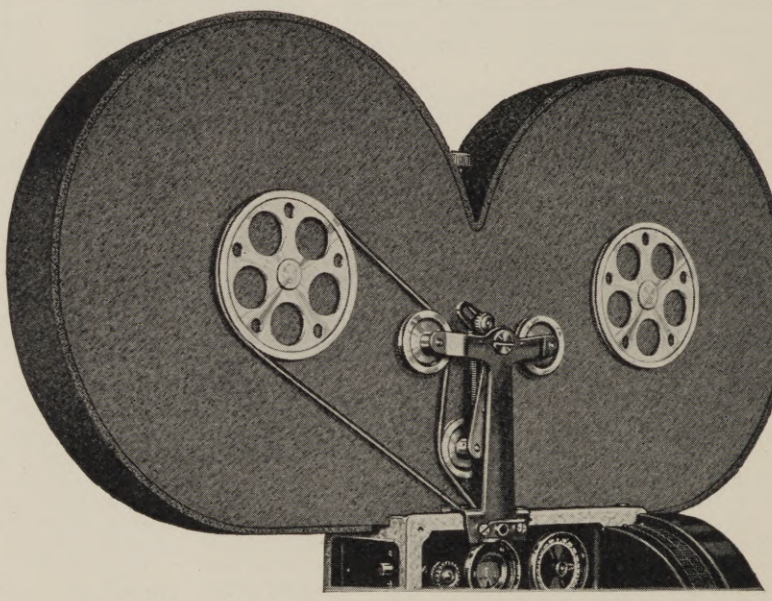
BELL & HOWELL

Achieve the Zero of Silence

IN SOUND RECORDING CAMERAS

No camera booth—and the "mike" ten feet away!

Only the precision and scientific design of a Bell & Howell Silent Standard Camera would permit of such an arrangement. Sound pictures have wrought great changes in the movie industry, but they have not affected the mobility of Bell & Howell Cameras.



1000-foot sound-proof magazine with silent belt tension equalizer used on Bell & Howell Silent Standard Cameras

Silent fiber gears alternate with steel gears. Solid bronze and hardened steel bearings are used, tight yet free-running. Camera interior and shutter blades are sound-proofed with felt. Special magazines are sound-proofed through alterations in inner parts and outer sponge rubber covering. Film take-up is automatically controlled by silent belt tension equalizer.

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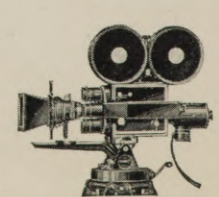

SOME PROPERTIES OF FINE-GRAIN MOTION PICTURE FILM DEVELOPERS

A Paper Presented at the Spring Meeting of the Society of Motion Picture Engineers at New York City, May 6 to 9, 1929

By H. L. CARLTON AND J. I. CRABTREE

[This paper, Communication No. 388 from the Kodak Research Laboratories, Rochester, N. Y., will be printed in two parts. The second part will appear in the August issue of the American Cinematographer.—Editor's Note.]

SINCE the publication of the Kodak fine-grain developer formula for motion picture film[1] many requests have been received for further details pertaining to its use, and for methods of altering its photographic characteristics. Experience has shown that the developer cannot be exhausted to the same degree as many developers which have been used previously because it is more sensitive to the retarding action of the products of development. Also a black sludge of metallic silver forms in the developer during its use, and with an exhausted developer an excess of sludge is present which tends to deposit on the negative.

The present work was undertaken in order to investigate:

(a) The useful life of the borax developer during which no appreciable loss in the speed of the emulsion is incurred.

(b) Methods for maintaining the rate of development constant for use in machine development.

(c) Methods for increasing or decreasing the rate of development to satisfy the requirements of the various film laboratories.

(d) Methods of obtaining finer-grained negatives.

I. METHODS OF MEASURING THE PHOTOGRAPHIC CHARACTERISTICS OF THE DEVELOPER

General methods of testing photographic developers have been described by one of the authors.[2] These general methods supplemented by those described below, were used.

(A) Method of Development

Development was carried out in exactly the same manner as recommended for the development of motion picture film by the rack and reel systems.[3] All the data on mixing, exhaustion, and revival were obtained from the use of a 120-gallon tank of developer employed in the routine way for commercial work.

A miniature duplicate of the commercial rack and tank apparatus was used for testing and exhausting the experimental developers. Glass battery jars holding one-half gallon of developer were kept at constant temperature by circulating tempered water around them. Small racks were used holding 50 inches of motion picture film and were constructed like the racks used in regular motion picture work. Checks were made at frequent intervals to insure conditions corresponding to those found in commercial practice.

A standard manipulative treatment was given in all cases as follows: The rack was agitated by lifting about two-thirds of the way out of the developer. To start the development, the lower cross bar was just dipped under the solution and then wiped under the solution with a general sweeping motion of the hand to remove air-bells.[4] The upper part of the rack was next immersed and the top cross bar wiped in the same way, the whole immersion procedure taking no more than five seconds. The rack was then gently moved with a circular motion in the developer, and agitated at the end of 45 seconds and again at the end of every minute until development was complete.

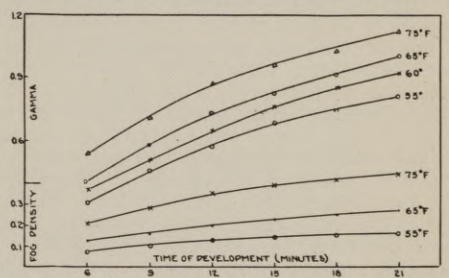

Fig. 2. Time-gamma and time-fog curves for borax developer at different temperatures. (Rack and Tank method).

(B) Sensitometry

Most of the sensitometric measurements were made with Eastman motion picture panchromatic negative film (type 2). One emulsion was chosen and used for the tests on the various developers so that all the tests were comparative.

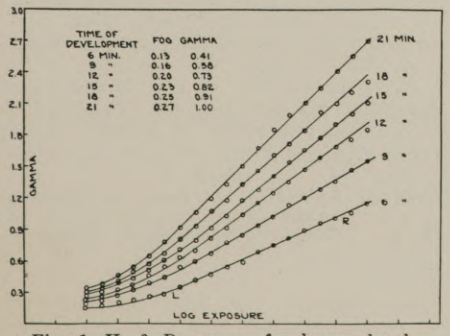

Fig. 1. H. & D. curves for borax developer with varying times of development at 65°F. (Rack and Tank method).

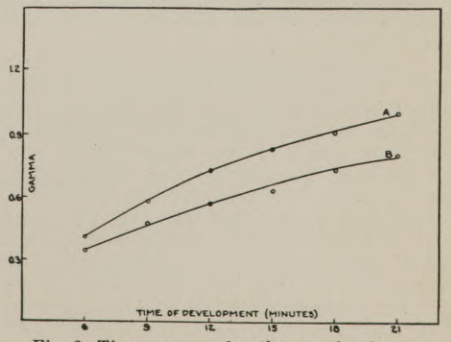

Fig. 3. Time-gamma for the regular borax developer (a) and with half concentration of borax and developing agents (b). Rack and tank method at 65°F.

The standard sensitometric method of Hurter and Driffield was employed. This method is described in detail by Jones and Crabtree.[5]

The sensitometer for making the standard exposures was similar to that described by Jones.[6] The exposures were produced by a single revolution of a sector wheel which gave nineteen exposures differing by the factor of the square root of two. The light source was an acetylene burner screened to noonday sun with a No. 79 Wratten filter.

In studying the characteristics of a developer, a series of strips exposed upon the sensitometer were developed for 6, 9, 12, 15, 18, and 21 minutes. When the characteristic H. & D. curves were plotted, a family of curves was obtained as shown in Fig. 1. These curves illustrate the effect, on the characteristics of the negative, of increasing the time of development. With increased time of development the densities in the highlights at R increase much faster than the shadows at L and give a corresponding increase in the density contrast of the negative.

Each of the curves has a straight line portion and the angle made at the intersection of this extended straight line with the exposure axis is a measure of the degree of development. This angle increases with the time of development. The tangent of this angle affords a numerical measure of the amount of development and is called the development factor or gamma.

In the lower exposure region which corresponds to the shadows at L, each of the curves deviates from the straight line and becomes more nearly parallel to the exposure axis. This portion of the curve is called the underexposure region of the characteristic curve in contrast to the straight line portion which is called the region of correct exposure. This underexposure region is often called the toe of the curve and extends up to the point where the density values begin to lie on a straight line. The shape of the toe is very important in reproduction because the extreme shadows in most normally exposed negatives and nearly all of the tones of an underexposed negative may fall on this portion of the curve.

The density contrast of the negative is the density difference between the extreme highlights and the extreme shadows and depends on both the brightness contrast of the subject and the degree of development. Although gamma and contrast of the negative do not have the same meaning, they are proportional when the exposure of the negative remains constant. Low gamma development gives a flat negative with low density contrast and high gamma gives a negative with high contrast.

(C) Fog Measurement

The fogging action of developers has been discussed by Crabtree[7] and by Dundon and Crabtree.[8] The fogging action varies greatly with the nature of the developer and is measured as the density of the deposit of an unexposed portion of the film, such as the area outside of the perforations on a strip of motion picture negative. Normal fog densities range from 0.10 to 0.25.

(D) Speed of Emulsion

It is customary to specify the speed or sensitivity of a photographic material in terms of the exposure value (inertia) where the straight-line portion of the H. & D. curve extended cuts the exposure axis.[5] This, however, is not a true indication of the relative density-giving power of the emulsion when exposed to light of different colors or wave-lengths. Methods of determining relative speeds to various portions of the spectrum have also been outlined previously.[5]

When discussing relative speed values, the cameraman is primarily concerned with the ability of an emulsion to render detail in the deep shadows with an underexposure. This property can be numerically evaluated for some emulsions by a study of the characteristic curve. A line is drawn through the plotted fog values and parallel to the exposure axis. The straight-line portion of the curve is then extended to cut this line and the exposure value at this intersection may be considered as a measure of the **speed** of the emulsion. For a faster film the exposure value is smaller so that the **reciprocal of the exposure value** gives a numerical value of the speed of the emulsion. This makes a fairly accurate method for numerically evaluating the shadow rendering power as long as a constant degree of development is used, and the straight-line portion of the curve extends down to density readings of 0.3 to 0.4. In other words, this method holds when the characteristic curve for the emulsion does not have a long underexposure region.

With some emulsions the toe of the curve is relatively long and rounded up to a density value of 1.0. In this case the projection of the straight-line portion above a density value of 1.0 is not an accurate measure of the speed of the emulsion. A method has been described by Jones and Russell[9] for evaluating the speed of such an emulsion in terms of the **minimum useful density gradient.** For this purpose the point is taken on the curve where the tangent has a value of 0.2 and the point of intersection of this tangent with the line drawn through the plotted fog value and parallel to the exposure axis is a measure of the speed of the emulsion. With emulsions which have long rounded toes, this method is far more indicative of the speed of the emulsion for the cameraman than the standard method outlined above.

The speed measurements made in this investigation were made with an emulsion which had a very short toe so that the speed measurements calculated from the inertia value were a fairly true measure of the speed of the emulsion for the cameraman.

II. PHOTOGRAPHIC CHARACTERISTICS OF THE FRESH BORAX DEVELOPER

(A) Characteristic H. & D. Curves

Typical H. & D. curves for Eastman motion picture panchromatic film (type 2) developed for varying times in the borax developer are shown in Fig. 1. When the exposures are within the limits on the exposure axis that correspond to the straight-line portion of the curve, correct reproduction is obtained. When a subject is underexposed, part of the exposures fall in the region of the toe and correct reproduction is not obtained.

Similar H. & D. tests were made with the MQ-80 tank developer[3] which has a much higher rate of development. The borax developer gave more emulsion speed for the higher degrees of development. For a low degree of development the curves were practically identical. The development of detail in the toe part of the curve with the MQ-80 developer is inhibited by the potassium bromide which is used to prevent the developer from giving excessive fog.

(B) Time-Gamma Curves

Examination of Fig. 1 shows that the extent of development or contrast of the negative increases with the time of development. This relation between the contrast and time of development, which is a fundamental characteristic of every negative developer, is recorded by plotting the time of development against the gamma. (The gamma is the tangent of the angle made by the intersection of the extension of the straight-line portion of the curve with the exposure axis). Fig. 2 gives time-gamma curves for four different temperatures including one above and two below the usual development temperature, 65°F.

The gamma value for a constant time of development is a measure of the rate of development. Examination of Fig. 2 shows that when developing for 15 minutes an increase in the temperature of the developer from 55°F. to 75°F. increases the rate of development indicated by a rise in gamma from 0.68 to 0.96.

The rate of development and the shape of the time-gamma curve depend upon the method of development used. A comparison was made of the relative rates of development with rack and tank, with reel, and with brush development. Brush development gives maximum agitation of the developer and removal of the oxidation products from the surface of the developer and approximates the rate of development obtained by machine methods. Results are given in Table I for the rate of development obtained by these three methods.

Table I

Effect of Agitation on Rate of Development

Treatment	6 Min. Gamma	9 Min. Gamma	12 Min. Gamma	15 Min. Gamma	18 Min. Gamma	21 Min. Gamma
Rack and Tank.....	0.41	0.58	0.65	0.83	0.91	1.00
Reel development....	0.54	0.77	0.95	1.03	1.11	1.20
Brush development	0.57	0.79	0.97	1.07	1.13	1.23

The brush and the reel methods give practically the same rate of development and correspond with the maximum agitation that can be produced under practical conditions. Over the range tested the rack method takes

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Helen Twelvetrees and Frank Albertson in "Blue Skies," a Wm. Fox production

On Tinted Film

Continued from Page 6

visual sensation produced by the action on the retina of equal intensity of radiation of the various wave-lengths, as indicated by the abscissa values.

By judicious choice of dyes and dye mixtures which give spectral absorptions correctly adjusted with respect to the photo-electric response and to the retinal sensitivity, it has been found possible to produce a series of colors having hues distributed throughout the entire hue scale and at the same time having relatively low densities as measured with either the potassium or the caesium photo-electric cell-tungsten lamp (3000°K) combination.

As a preliminary to this work a careful spectrophotometric analysis showing the selective absorption characteristics of several hundred available dyes was made. It was soon found that it would be quite impossible to produce colors of the red, orange, yellow group without absorbing some of the radiation to which these photo-electric cells are most sensitive. The question then arose as to the absorption permissible in practice. There are really two phases to this particular problem, one involving a determination or decision as to the magnitude of photo-electric absorption for which satisfactory compensation can be made by increasing amplification without encountering serious electrical difficulties or sacrifice of quality in the reproduced sound. The other involves a consideration of the volume change which takes place in passing from one color to another when these are assembled consecutively in a reel of sound positive.

A large number of experiments were made in this laboratory to gather information upon which a rational decision relative to these points could be made. After having reached conclusions as to satisfactory values for maximum and minimum photo-electric density values, the matter was discussed with several authorities in the field of photographic sound production, communicating engineering, and acoustics. The opinions from these individuals correspond surprisingly well with those based upon our experimental results. There seems to be no difficulty encountered in increasing amplification to compensate a photo-electric density of 0.3. This photo-electric density can be looked upon as equivalent to a certain loss of volume which in turn can be expressed in terms of transmission units (decibels). In order to convert a density value, density being defined as the logarithm of the reciprocal of transmission, to equivalent decibels it is only necessary to multiply by 20. Thus, if an optical density of 0.3 (measured of course in terms of the photo-electric cell and tungsten lamp combination being used) be inserted between the exciting lamp and the photo-electric it will be necessary to increase the amplification by 6 decibels in order to obtain the same volume output. On commercial equipment the volume control is adjustable by steps, in some cases each step corresponding to 2 decibels, and in others to 3 decibels. Thus, the use of a

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A. S. C. Member Treed by Wild Buffalo in East African Jungle

Clyde DeVinna Writes a Few Interesting Lines from East Africa, Where He Is Photographing M-G-M's "Trader Horn." Headquarters at Nairobi.

By Clyde De Vinna, *A. S. C.*

A FELLOW never quite knows how lovely Hollywood is until he finds himself stuck away off in a place like this. Then when he is lying awake at night wondering if the mosquitoes will find their way through the netting around his cot, and wondering if there will ever be another breath of cool air for him—well, he just can't help thinking about Hollywood, the studios, the pretty flowers of California, and of the friends so far away.

Tonight I would give a great deal to be able to drop in at a meeting of the A. S. C. and chew the fat with the old gang. But instead I am wishing I had an electric fan here to help keep me cool while I am writing.

However, it's all in the game, and when we get back with our picture no doubt all of us will be darned glad we suffered with the heat, dirt and insects. After all, what we are all striving for is a better picture than ever before, and I think that is what we are going to have in "Trader Horn."

I thought that perhaps some of you would like to hear something about this neck of the woods and what we are doing, so here goes. We arrived down here in April —that is, our advance party. Came ahead of the gang in order to build a laboratory where we will do our own developing. After a lot of hard work that has been accomplished and we are set to go. A little later I might have some pictures of the laboratory and will send them along so you can see how we are doing it down here in the wilds of Africa.

Where to begin on the country is a problem. Nairobi is nothing to crow about as one's home town. In fact none of the towns would make a man want to ever return. But there are many people here who have lived here for years and seem to like it. They have all sorts of excellent liquor here, of course, but aside from that and the high prices of everything, there is not much to make the place stand out.

Up to this writing we have been dashing about the country seeking locations. Some are good and others are not worth writing home about. But we have found some that are wonderful and worth coming to get. Getting around down here is a tough job. The roads are nothing but dust when it is dry, and when it rains they are impassable.

On one trip up into the Kisumu country I ran into the hardest going since the Painted Desert trip I once took. When we reached Kisumu we found a hot, miserable little place on the edge of Lake Victoria, with almost no accommodations, but billions of mosquitoes.

The next day went in a launch to Crocodile Island where the "crocs" are supposed to hold their conventions. They were not convening that day. Only a dozen or so were there. But one, that I shot at and missed, was more than 25 feet in length. Six or eight Hippos were very curious about what we were doing there, and hung around a few hundred yards from the shore all the time, but we could only see their snoots as they came up for air.

Started home by auto the next afternoon. It began to rain and on one hill the mud was so bad it took us two hours to go three miles. Damnest mud I ever saw!

And then we hit a swarm of locusts so thick we couldn't see the road fifty feet ahead of the car, and so many in the sky that it looked like a cloudy day. We stopped and put up the curtains when we saw the swarm ahead, but even then they got in and we had a few thousand of them in, on, and around the car. A few miles further, after we had run out of the swarm, we stopped for the double purpose of refilling the radiator and picking the pesky things out of the machinery. A few natives were there getting water, and when they saw the locusts they made a run for the car and picked them off as fast as they could. Locusts are considered good eats by them—they dry 'em and fix 'em up some way or another. I wasn't interested;

Wa-Kamba Medicine Man and his "patients" are pic-tutred below. Photographed by Clyde DeVinna, A. S. C., in the Nzeeni district of East Africa. Above is DeVinna (center) watching a swarm of locusts pass by. The natives eat these insects.

but the natives certainly cleaned the car thoroughly—even picked the radiator perfectly clean of them. And it was chock full.

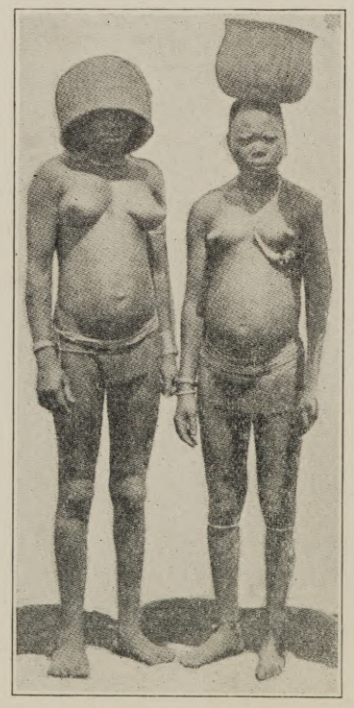
Came by another lake, about a mile from the road, and I noticed a pink fringe extending around the edge of the lake and reaching out quite a way into the wated. I made some remark about beautiful pond lilies, but a guide said they were birds—Flamingoes. I thought he was a liar, as I was sure I knew flowers from birds. But I put the glasses on them and the guide was right. There were millions of them.

Saw a troupe of baboons—stopped and fired into them just to frighten them. Succeeded. You should have seen them run. They stood about four feet high when standing erect. When we got back to Nairobi we spent nearly a day in the bath tub trying to get the dirt and dust washed off. Even the tubs here seemed heavenly after the tin buckets we had to use on the trip.

The next trip found us pitching camp in one of the African rains. If you think you ever saw it rain you haven't not until you stop here in a rain. But these black boys sure know their onions when it comes to making camp. They put up our tent and whether you believe it or not there was nothing wet in it or under it. Just as snug as a bug in a rug, we were.

Got our first taste of game on this trip. Ran across a herd of Impala and I was extremely lucky in bagging one at about 375 yards. Fresh steaks for supper. Good, too!

Went over in the Ngong district on another location hunt. I drove off alone until I came to the end of the trail. I left the car and walked some distance to look over what seemed like a fine spot. There I discovered a bunch of Colubu monkeys holding a circus or something like that. I stopped to watch them and was so intent on their affairs that I didn't notice the bellowing of something or other behind me for some time. Then I turned around finally and looked to see where the cows were.



Latest fashion news from Africa. The ladies invert the hat when it rains.

Imagine my chagrin when I discovered they were not cows, but three enormous buffalo. And boy, they are nasty birds down here. They hadn't seen me, however. There was a convenient tree nearby, so I quiety became part of the Colubu circus outfit and finally came to roost about fifteen feet from the ground in a nice, soft fork of the tree.

Luckily the wind was in the wrong direction and the buffalo did not discover I was around. They came down to the stream, took a drink and busted off through the brush. After I was sure they would not be back I climbed down and departed for camp. I had a 45 Colt with me, but fortunately, I did not think of shooting at them with it, for they tell me here that these bucalo are bad eggs when wounded and hunters are warned to use only heavy rifles that will stop them with the first bullet.

I have my radio set along and take it everywhere. As yet I have not been able to get through the air to California, but hope to get there before long.

Will send you a lot more dope on our doings later.

Olive Oil for now.

FROM ASSISTANT CAMERAMAN TO MOTION PICTURE STAR

This Is the Story of George O'Brien, Fox Star. He Once Assisted Dan Clark, A. S. C., and Carried Cameras for the Tom Mix Unit.

By JOHN PARKER

IF GEORGE O'BRIEN hadn't believed everything that a motion picture star told him he would probably be just a hard-boiled sailor scrubbing decks or shining cabin doorknobs.

However, George had faith—and today he is riding the crest of the wave of popularity and success. All of which leads us to the point that it really was Tom Mix who "discovered" O'Brien.

George had come back from the World War with an "itching heel," as it were. He had left medical school to go into the navy, and when the war was over he didn't feel like going to school any more. So he wandered about San Francisco, his home town, for some time. One day Tom Mix came to town and was shooting a Western nearby. George used to go out and watch him. Tom finally noticed this youngster and took a liking to him. The day Tom left for Hollywood he bade George goodbye and told him if he ever decided to go into pictures to come to Hollywood and see him.

"I think you ought to make a good cameraman," said Mix, "So if you decide to become one, just look me up."

George played football a little later and was so banged up he had to go to the hospital. While lying there he decided it would be a good thing to be a cameraman.

A short time later Mix was driving in through the gate of the Fox Studio when he spied George standing there.

"Hello, George, what are you doing here?" asked Mix.

"Hello, Mr. Mix. I came down to accept your offer," and George smiled.

"Tom looked me over," explains George, "and with a rather long face explained that his own unit was pretty crowded but he would see what he could do with some other unit."

A few days later George was working in the camera department at the magnificent salary of fifteen dollars a week.

"And if you think living in Hollywood on fifteen dollars a week is easy, you are mistaken," declares O'Brien. "But it was wonderful, just the same, and I would not have missed it.

"I buckled in with all I had to make good. I carried cameras and did everything the cameraman told me. At night I went into the laboratory and delved into the mysteries of developing, with the thought ever in mind that I would become a cinematographer or 'bust.'

Dan Clark, A. S. C., and George O'Brien, Fox Star, show us how they looked in the days when George was Dan's assistant.

See if you can pick out George O'Brien, Fox Star, who was an assistant cameraman for the Tom Mix unit when this picture was made.

"The cameramen were really wonderful. They apparently liked me and gave me all the advice in the world, with the result that I eventually became a regular assistant and found myself being allowed sometimes to crank the camera myself.

"It was here that Dan Clark and I formed a remarkable friendship. Dan at that time was getting $25 a week. I was getting $15. Between us we didn't have so much. So we decided to get a room together at the Y. M. C. A. The room cost us eleven dollars a month. It had two army cots and one small rug. As the floor was concrete the rug was a nice thing in the morning when you stepped out of bed. We used to toss the rug agross the floor as soon as we had finished with it so the other fellow could use it to step on.

"Dan and I had one top-coat between us. And when I went out on a cool night and had announced my going early, I wore the coat and Dan stayed home or was cold. We shared the neckties the same way. When we both had to go out the same night one wore the coat, the other the good necktie.

"Finally, Dan and I were both working with the Mix unit and then things perked up for us in the food line. Mix always took a 'chuck' wagon on location each day. Dan and I would eat a tremendous meal at noon from the wagon, which was free. Then we only needed a light supper which saved money. But those were won-

derful days, and Dan and I used to solve all the problems of the picture game some evenings.

"Lewis Milestone used to come up and get a free bed at our room now and then when one of us was out, for Lewis was up against the problem of living. So was Richard Wallace, who was cutting pictures then. We all talked the things over and wondered what it was all about many times.

"Then, at the end of two years, Fox gave me a raise of five dollars a week. It took the combined efforts of Mix and a half dozen others of importance to get the raise through. I was getting $20 a week!

"An opportunity came to go to another studio at $35, so I took it. At the end of the third week the company went broke and I was out of a job. Then the old fifteen a week would have looked good. But I would not go back to Fox again.

"After a while I decided that I would not make a good cameraman, anyway. All the time I had been working I had been watching the actors and directors, and my heart lay in that direction. So I suddenly packed up and went back to Frisco, intending to go to sea. In fact I had signed on with a ship when I ran into Hobart Bosworth in Frisco. He asked me what I was doing. I told him I was going to sea. He said he needed some men to play the part of sailors, so I withdrew from the ship and became an extra in Bosworth's outfit. That was the turning point for me.

"George Melford came up there shortly afterward and I got a job with him. And then I had to come to Hollywood to finish the interiors. I was getting $75 a week. Imagine!

"Well, from then on I was determined to be an actor. But there were times when I wondered if it would ever pay me to spend the best part of my life wandering around Hollywood waiting for a job. Jobs came here and there as extra, and finally I became a $25-a-day man doing bits and small parts that required riding and athletic ability.

"Skipping over a long time I go to the time when Fox was looking for a man to play in the "U. P." trail. You know, "The Iron Horse." I had been up for another big part before, but after they decided I would be fine they turned me down because I had no name. So I did not think much about it when Fox gave me a test this time.

"Weeks went by and I did not hear from Ford, the director, or from anyone at Fox. Frank Lloyd was making a picture and I had the chance to sign on as a galley slave. So I went to Fox's officials and asked what to do. They said to go on with Lloyd. I signed up and was about to start work when I received a frantic series of calls from about everyone at the Fox Studio. I had been given the part.

"You know the rest of the story. No need to tell any more."

He was right, for who doesn't know about O'Brien and his work of recent years?

But George through it all has not forgotten the days when he lugged a camera around on his shoulder for his boss cameraman. He never will forget those days or those cameramen.

"They are a wonderful group of men, these cameramen," declared George when talking about the old days. "Hearts as big as mountains and always ready to help everyone. And artists—they are magnificent artists and get all too little credit for their artistry. Where would lots of us be if it were not for the magnificent artistry of these men who hide their light under a bushel and leave the glory to the rest of us!"

Richard Eichberg, a German producer, has arranged to use the Stille process for the sound part of his next production. This message from Berlin is evidence of the interest aroused by the "Sound on Wire" process.

A spectrum of sixteen delicate atmospheric colors, keyed to the moods of the screen, in the new series of **EASTMAN**

SONOCHROME

TINTED POSITIVE FILMS FOR SOUND PICTURES

NEW COLOR

with

EASTMAN SONO

ROSE DOREE—A rose pink that quickens the respiration. The tint of passionate love, excitement, abandon, fête days, carnivals, heavily sensuous surroundings.

PEACHBLOW—*Allegretto vivace.* A tint for brief, joyous moments, buoying up scenes of light, sensuous content. The spirit of coquetry. An excellent tint for close-ups.

AFTERGLOW—Less radiant than Peachblow, yet warm and stimulating. Café, banquet scenes, gardens, sunsets, late autumn.

FIRELIGHT—A cheerful orange tint—in interiors suggestive of warmth, intimacy, comfort. A mellow autumnal light.

CANDLEFLAME—In the middle tempos, but blending happily with all active moods. For general use in interiors. For exteriors morning and afternoon, with but little sky area.

SUNSHINE—The generous brilliancy of mid-day sunlight. Of use where the light of the sun plays prominently in fixing the locale or the mood . . . sunlight streaming through windows, Mexican patios, the desert.

VERDANTE—In the *larghetto* range. Refreshing. The sunny green of vegetation in spring and early summer. Simply furnished interiors.

AQUAGREEN—Emotionally cool, soothing, relaxing. Especially suited to water scenes outside the tropics. One of the wettest colors imaginable.

A Complete Gamut of Colors

SIXTEEN expressive tints — new to the screen, embracing the entire color spectrum, rich and varied in their emotional effects — comprise the new series of Eastman tinted base films known as Sonochrome.

Eastman Sonochrome provides a relief from the black and white of the present sound film and a wider range of expressive hues than the motion picture ever before possessed!

In hue and atmospheric quality Eastman Sonochrome can closely simulate the actual lighting of any exterior or interior scene. Lighting of realistic color content is a primary emotional source to which the motion picture never before has had such free access.

Sonochrome colors have definite affective values. Some excite, some tranquilize, some repress. Properly used, they enhance the moods of the screen and aid the powers of reproductive imagination in the observer, without making a distinct impression on the consciousness.

In Sonochrome, the maker of motion pictures will find an efficient and highly refined instrument for achieving dramatic effects, and the audience a new emotional experience.

MOODS FOR THE SCREEN

SONOCHROME FILM

The First for Sound Pictures

PREVIOUS attempts to use color on sound film have resulted in cutting off the light that excites the photoelectric cell, so interfering with the reproduction of sound. With the new Sonochrome tints this difficulty has been overcome, for they are so adjusted as to position in the spectrum that they do not blind the photoelectric eye.

The light to which the photoelectric cell responds passes freely through Sonochrome film, and the response is uniform over the entire gamut of tints.

For this reason Sonochrome tints, including the hueless argent substitute for clear positive, may be used in any sequence, permitting absolute freedom in the shifting of moods, without affecting the sound.

The Eastman Sonochrome tinted films are available at no greater cost than the regular clear base positive film.

Eastman Kodak Company, Rochester, N. Y., will gladly send you further information about

EASTMAN SONOCHROME FILM

TURQUOISE—With the liquid characteristics of Aquagreen, but cooler . . . the Mediterranean, the cool of dawn, bright moonlight.

AZURE—The tint of reserve and distance. In exteriors spacious, atmospheric—the blue of tropical skies. In interiors cold, formal, repressive.

NOCTURNE—For night effects, murky interiors. Maximum repression. The color mood of sadness, defeated expectation, dark intrigue, the underworld.

PURPLEHAZE—Rising somewhat in pitch from Nocturne. For dim interiors and outdoor settings obscured with haze. Languorous, dreamy, narcotic.

FLEUR DE LIS—*Tempo di marcia pomposo.* The time-honored hue of the ceremonial, the ritualistic. Pompous, solemn, stately. The purple of royalty.

AMARANTH—A less austere purple than Fleur de lis. Suggestive of gentility, aristocracy. Heightening the elegance and luxury of certain interiors. Balcony scenes at night illuminated from within.

CAPRICE—In the range of rapid tempos. An audacious magenta. The mood of fickleness, impulsive action, rash adventure.

INFERNO—*Agitato.* Intensely stirring with strong sounds and movements . . . fiery revolt, riot, conflagration, disaster, unrestrained passion.

ARGENT—A silvery hueless tone, less harsh than that of ordinary black and white positive. Of general utility for all untinted scenes.

They warm love, inflame passion, heighten joy, strengthen courage, deepen sadness . . . . .

FOR the first time, all the serviceable associations of color tones are brought to the aid of the sound picture in the new Eastman Sonochrome Films, a chromatic series of sound positives.

Sonochrome has sixteen color moods, keyed so that a smooth transition is always possible from one to another, or back to the basic argent tone, without perceptible change in sound level.

Pictures in Sonochrome tints have a variety and a sustained interest that can not be achieved with black and white positive alone.

The most imaginative productions of the year will be screened in Sonochrome.

EASTMAN SONOCHROME

A PRODUCT OF THE COLOR LABORATORY OF THE

EASTMAN KODAK COMPANY

A. B. C. of Sound Pictures

Continued from Page 15

it possesses "electro-kinetic energy." A certain loss of energy is always present in all electrical systems due to the conversion of part of it in heat energy and of part of it in electro-magnetic radiations, the latter being assumed to be due to the fact that some of the electrons discharged from moleculae to moleculae assume sufficient velocity to escape from the conductor, and to form a sort of electric envelope around the conductor, or better, around the current it self.

These losses of energy are referred to in terms of "resistance" and measured in ohms, which is the unit of resistance thus named from G. S. Ohm, who promulgated the laws of resistivity of conductors.

The resistivity of any conductor depends upon the material of which it is made; in other words, upon its conductivity, its size, or better, its section, and upon its length or shape.

It has been said above, that part of the loss of energy is due to electro-magnetic radiations. These radiations form a magnetic field which surrounds the conductor, or better, surrounds the electric current which flows through it.

The intensity of the magnetic field is proportional to that of the current and its flow is characterized by two motions, one around and the other in the same direction as the current.

An electric current may flow continuously in one direction, or may at equal periods, alternatively reverse its directions. In the first case the current is called "direct current," and for brevity "D. C."; and in the second case it is called "alternating current," or "A. C."

The magnetic field follows the direction of the current and, therefore, in the case of alternating current it reverses its direction in accordance with the periodical reversal of the current itself.

It is characteristic of the two currents that D. C. flows only in conductors, while A. C. flows also in insulators.

If two metallic plates, close to each other and separated by an insulator, be this air, glass, or other non-conducting material, are inserted in a circuit comprising a battery, producing a supply of electro-motive force, a momentary flow of current takes place in the circuit and negative electricity is accumulated on the interior face of the plate on the farther side of the insulator and reacts upon the positive electricity equally distributed on the two faces of the other plate which we will call the **first plate** as being the one first reached by the flow of current. This positive electricity is accumulated by this reaction on the inner face of the first plate. The exterior face of this plate can, therefore, receive another supply of electricity from the battery.

This supplementary supply goes through the same process, as just explained, that is to say, negative electricity is again accumulated on the inner face of the second plate across the insulator, positive electricity is again accumulated on the inner face of the first plate and the outer face of this plate is again ready to receive a fresh supply of electricity. This process goes on until an equilibrium is established between the charge of the outer face of the first plate and the electric pressure from the battery.

In electrical terms the flow of current ceases as soon as the "potential difference" of the medium is equal to the "electro-motive force" of the battery.

The apparatus consisting of the two plates separated by an insulator is called "a condenser." The insulator is called the "dielectric."

Large quantities of electro-static energy can be accumulated on the surface of a condenser.

The capacity of the condenser, that is to say, its ability to accumulate electro-static energy, is dependent upon the size of the plates, their distance apart, and the nature of the dielectric.

If the capacity of the condenser is overtaxed a spark will pass between the two plates and the dielectric will break. The condenser is then said to be punctured.

(To Be Continued)

Academy to Make Survey

A survey of motion picture sound production problems in all the larger Hollywood Studios is now being made under the auspices of the Academy of Motion Picture Arts and Sciences.

The survey is preparatory to a projected series of investigations and tests to present the basic methods for problems common to all studios. Cooperating with the Academy are the technical bureau of the Association of Motion Picture Producers; R. C. A., and the Electrical Research Products, Inc.

The projection is planned along the same lines as the inquiry into incandescent lighting which was conducted by the A. S. C. and the Academy last year.

A. S. C. Member Heads Victor Studio Cinematographers

Frank Zucker, A. S. C., has been appointed chief cinematographer at the Victor Phonograph Studio, Camden, N. J. Mr. Zucker has long been one of the outstanding cinematographers of the industry, and is president of the Cameramen's Union, Local 644 in the East.

Filmo Duplicator

Many amusing effects may be obtained with a simple, inexpensive accessory known as the Filmo Duplicator. This unit consists of a prism of optical glass, mounted so that it may be easily placed over the universal or focusing mount 1″ F 3.5 Filmo 70 or 20 mm. F 3.5 Filmo 75 lens in place of the sunshade. A subject filmed through the Duplicator is shown as a double image upon the film. A man playing golf, runnin, or walking would have a double. A horse jumping would appear as two horses jumping. Many comedy tricks can be devised by the amateur and incorporated into his film productions with this new device.

Crystal Mirror Surface Screen for Kodacolor

The Crystal Mirror Surface Screen is another new development which contributes to the perfection of Kodacolor pictures. Its surface is remarkably high in reflective power, and is of the finest texture. These qualities are essential to the best Kodacolor results.

These new screens are of the rigid frame type, giving a permanent flat projection surface. The frame is of neat wood moulding, finished in a light walnut brown. Pivoting feet are supplied for supporting the screen, as shown in the accompanying illustration. Three sizes are available: 16½x22 inches, 24x32 inches, and 30x42 inches.

Avoid Past Mistakes

WITH summer here again, and a new season's activity staring us in the face, a really helpful plan for most amateurs would be to make out a list of the particular faults which have so far afflicted their work, and paste it conspicuously in their camera-cases. None of us are without some faults; all of us want to overcome them. But improvement is not to be had by the mere desire, nor by merely looking over past work and promptly forgetting the lessons therein embodied. Saying "Dammit, I always do **that** wrong!" in the projection-room doesn't help much unless **that** is kept in mind the next time the camera is used.

Anyone can make mistakes—but why make the same mistake twice if it can be avoided by a little care? Now the first step in avoiding such mistakes is remembering them when shooting; and, most memories being what they are, a handy list is really helpful. It may be embarrassing to be confronted with such a list in that important moment just before shooting a scene—but it's the best medicine in the world for ailing technique!

Of course everyone has his own particular troubles, but here are a few that will be good ones to start any list with. First—cutting scenes too short. Everyone does it; the seconds seem so much longer when you're pressing a camera-button than they do when you're watching the result on the screen. If anything, a scene is better too long than too short, for you can always trim down a long one—but what can you do with an over-short one?

Naturally, this involves using more film, but it eventually means a great saving, for there will be less lost footage from inadequately timed scenes and discarded sequences. One of the most bewildering practices of professional production is the apparently reckless expenditure of film, in every sequence thousands of feet are shot over and above what the script calls for; close-ups, medium-shots, long-shots, angle-shots—every conceivable variation is tried lest later it be needed and the whole company be recalled just to make it. Obviously the cost of the extra film thus used is nothing compared to the staggering cost of recalling a whole company, the operating cost of which may be several hundred dollars **a minute,** for one or two small scenes. Of course, no amateur need follow that practice literally, but all should bear in mind the principle. Although film is expensive, the little trimmed out of an over-long scene is far less costly than the whole of an over-short one thrown away. Thus it is far the wiser plan to time each scene **at least** ten seconds—fifteen is better—carefully and **slowly** counting the while. At that it is little enough—only fifteen feet standard, or 7½ feet 16 mm. Even 'flashes' are best made comfortably long, for they can always be trimmed down, but never lengthened.

Keep Cameras Clean

Another item for most lists is keeping cameras and projectors clean and well-oiled. We ask so much of the poor things that we ought to at least give them this much in return. The amount of care given a camera is one of the surest ways to differentiate the truly fine craftsman from the ordinary worker. As a rule, the better the worker, the better his camera; and the instruments of most professional cinematographers are as immaculate as a West Pointer on dress parade. With them it is a matter of business and a matetr of pride; on their cameras depend their living and their professional reputations; therefore it is vital that they be always kept in perfect condition.

Though the amateur does not depend for his livelihood on his camera and the quality of work it turns out, his artistic reputation and personal satisfaction do depend on it. Therefore it is just as much to his advantage to keep his outfit perpetually at its best as it is to the professional's. Fortunately, in most amateur outfits the matter of maintenance is simplified to the minimum; the whole is as simple as possible, and the more delicate parts are carefully tucked away in a fairly dust-proof case. But the exposed parts—the various agents used to actually move the film—should be kept clean, and the inside of the camera-box itself should be kept free from the tiny shreds of celluloid, bits of dust, etc., that invariably accumulate there. The parts that require oil should be oiled regularly, but sparingly; too much oil is almost as bad as too little.

Finally, the lenses should be protected and kept clean. This is important. A single speck of dust doesn't matter so much, but when there are many of them they form a film over the lens surface that at least cuts down the brilliance of the image, and sometimes even affects the optical corrections of the lens. But be careful how you clean your lens! Only the very softest cloth, or, better, special lens-tissue, should be used, lest the delicate surfaces be scratched. Silk, though it appears soft and smooth, should never be used, nor should patent 'lens-liquids.'

When not in use, lenses should be kept covered, and always shielded from the direct rays of the sun, which seriously injure the polish, and sometimes even the cement between the elements of a compound lens. A leaf might well be taken from the professional's book—always keep spare lenses carefully capped, and wrapped in a soft cloth. If possible, have a special case devoted exclusively to lenses and filters. It saves them many hard knocks, and besides prolonging their usefulness generally, has the added advantage of keeping them always together.

And filters—don't handle them any more than necessary. Keep them even better shielded from the sun than lenses, and above all, don't forget that even the best filters have only a definite lifetime; don't try to stretch it too long. The filters generally used by amateurs are classed as 'fairly stable,' but even they deteriorate to some extent, and should be replaced occasionally. Professional cameramen, who have to carry a very extensive assortment of filters, generally replace them every few months, as a measure of precaution. While amateurs are hardly expected to follow suit, they should not, if they value the quality of their work, be too 'Scotch' in the matter. It doesn't pay.

Plan Your Shots

As a third item for the list comes one which might well go first: always be absolutely certain **what** you are going to shoot and **how** you propose to shoot it **before** you start.

Of course, except when producing a photoplay, most amateurs

Continued on Page 34

Better Modelling Lights

Continued from Page 7

beam a dark center by intercepting the light from the middle of the parabolic reflector. The divergence of the light from each element of the reflector is, however, enough to fill out the beam completely as soon as one is only a few feet from the unit.

It will be observed that the mirror is operated close to the lamp so that for a minimum diameter a maximum angle of light may be intercepted. This makes it necessary to hold the mirror on a hinged support so that it may be swung down out of the way when the lamp is renewed. The hinge should have a stop so that the mirror always returns to the same position. When the unit is initially assembled, care should be taken to adjust the mirror so that the image of the source is of the same size and is meshed in between actual coils of the source, as is shown in Fig. 4. This adjustment can be observed by looking

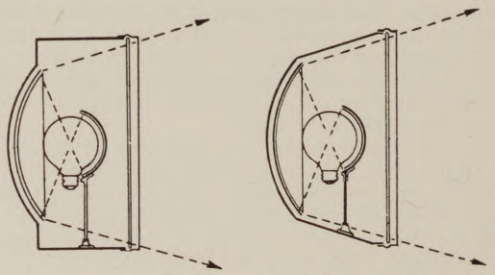


Fig. 6-Good design for reflector spots

at the two images of the filament of an unlighted lamp appearing in the parabolic reflector.

When a mirror spot is equipped with a long cylindrical barrel, the barrel will intercept and waste much of the light when the beam is spread. This is apparent from Fig. 5. The better practice is to use either a short barrel, or a longer one increasing in diameter, Fig. 6.

These, in brief, are the features to be watched in designing or purchasing modelling equipments. It pays to use the right kind, for they are more efficient, and thus save lighting costs; and they give improved lighting, which means better photography.

France

A new process for the manufacturing of color film was presented recently at the French Academy of Sciences by Professor d'Arsonval. It consists of a polychrome screen with which more exact colors and greater luminosity are obtained than with the trichrome screen system. This process, invented by M. Nordmann, further perfects the Berton invention. It is stated that the pictures projected by Professor d'Arsonval showed a brightness of colors which astounded the audience.

INFORMATION FOR AMATEURS

Amateurs—Send your problems to this department and have them solved by the world's finest cinematographers—the members of the A. S. C. This is your department. Our aim is SERVICE. Write us and find your answers here.

Question from L. R. S., Salt Lake City: How can I get the effect of partially diffused edges that I see in so much of the professional camerawork?

Ans.: Professional cinematographers get this effect by careful control of lighting, and by the use of gauze mats placed in front of the lens, in special holders. While there are no regular mat-boxes now made for amateur use, there are several holders made for the square glass color and effect filters; the amateur can easily use one of these for his mat-box, and making his own gauzes secure an almost unlimited range of effects. The gauzes should be mounted on a square frame of cardboard or heavy celluloid (the top of a cigarette-box is handy for this) and the desired opening in the center carefully burned out with a cigarette to whatever shape and size may be needed. An assortment of such gauzes of various textures, with and without holes, is a most useful accessory to any kind of cinematography.

Question from P. H., Oakland, Calif.: Is there any way to get the effect of reversed action with my Cine-Kodak, which has no reverse mechanism?

Ans.: The simplest way is to turn your camera upside-down and shoot your scene that way. When the film comes back from the laboratory, cut out the scene and re-splice it in with the rest so that it is 'heads up' with the other scenes; on the screen, the action is reversed.

Question from M. L. S., New York City: I make my own titles on 16mm. negative film, and the whites photograph as gray, and the blacks are not black enough. How can I get better contrast?

Ans.: Apparently you are doing your own developing. If so we recommend that you use a very contrasty developer—say Hydroquinone or M-Q—and then expose so that a very long, full development gives a dense black. If the type still grays over, a very brief treatment with Farmer's reducer will brighten it.

Question from R. G., Pittsburgh, Pa.: Is there any 35 mm. reversal film on the market?

Ans.: We do not believe so. However, a few years ago the Agfa A. G. had such a film on the German market, and may still make it. We suggest getting in touch with the Agfa-Ansco Corp., Binghampton, N. Y. It is possible, in an emergency, to reverse ordinary negative film, but the results are not perfect, and it is not recommended.

Question from R. H. S., Kansas City: What light condition is best for the making of Kodacolor pictures?

Ans.: The best Kodacolor pictures are made when the light is so bright that the normal exposure would be between f.11 and f.8. If the light is so bright that the aperture for normal exposure is about f.16 a neutral density filter should be used. A Cinophot or Dremophot exposure meter is of great aid in determining the condition of the light and whether it calls for the neutral density filter or not.

Question from R. B., Los Angeles: Can an amateur use the Technicolor Process in making 16mm. pictures? If so, where can I write for further information?

Ans.: Technicolor Process is purely a professional one devoted solely to the professional field. Special cameras using 35mm. film are used, and have to be rented from the Technicolor company.

Question from J. D., New York City: Is there a way by which I can make slow movies with a 16mm. camera?

Ans.: The Victor Animatograph Company, Davenport, Iowa, has just announced a new Cine-Camera that can be used for slow motion picture making on the same film —size 16mm.

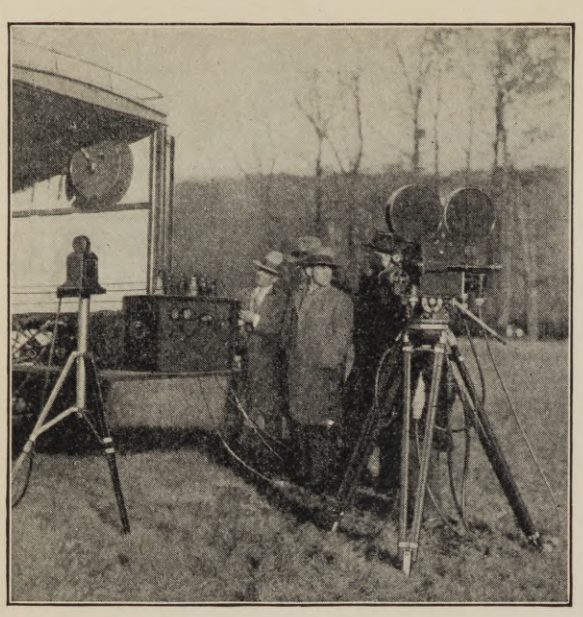
Is Your Filmo Registered?

For several reasons it is to your advantage that your Filmo Camera and Projector be registered with the Bell & Howell Company under your name and by the correct serial numbers. First, this entitles you to the protection of the two-year B. & H. guarantee. Second, it aids in recovering and returning your equipment should it become lost or stolen. Third, it makes available for you the benefits of the B. & H. Personal and Technical Service Departments.

If you have recently purchased a new camera or projector, or sold or exchanged your previous equipment, please give us the details so that all the units involved may be fully registered.

What a Difference a Filter Makes!

ABOVE are two photographs of the same scene. The one at the right, with the beautiful cloud, was made with an Optochrome-Ramstein color filter. The one at the left was made without a filter. The pictures speak for themselves and for the filter. Burleigh Brooks, of New York City, are sole agents for the United States and Canada for these filters. A Simplex Filter Set is gaining much favor throughout the country and are almost indispensable to the serious worker, amateur or professional. No gelatine is used in these filters, but they are made of a special pure optical glass.



This illustration shows the Akeley Gyro Tripod in actual use by the Western Electric Company, taking sound moving pictures.

Again AKELEY

. . . anticipated necessity
with a tripod ideal for Sound Pictures

"GIVE us the best camera tripod that human ingenuity can devise!" This was the demand of the sound cinematographers.

It was characteristic of the Akeley Company that its research laboratories had already anticipated this demand and were putting on the market such a tripod—a tripod quiet in operation, capable of great speed and flexibility, vibrationless but light, staunch yet easy to manage.

The Akeley Universal Gyro Tripod, containing the famous gyro mechanism, stands today a leader in this latest field of photography. This tripod is in constant use in many leading motion picture studios making Sound Pictures. These studios include Metro-Goldwyn-Mayer, Fox-Case Movietone, Pathe and Paramount. Other world wide corporations, such as Radio Corporation of America, Westinghouse Manufacturing Company, Western Electric Company and General Electric Company are enthusiastic users of the Akeley Gyro Tripod in their important work. We invite you to write for full description of this Tripod and details of our deferred payment plan.

AKELEY CAMERA INC.

175 Varick Street New York City

The Akeley Universal Gyro Tripod

MAKING MATTE SHOTS

Some of the Intricacies of Making Things Seem What They Are Not—Explained for the Amateur by an Expert with Years of Experience.

By FRED W. SERSEN
Chief of Art Department, Wm. Fox Studios

WRITING this article is rather an unusual way of of expressing my thoughts, as I have seen used to doing so by means of paint and brushes for the last twenty years, and juggling the pen is somewhat clumsy. The editor of this magazine asked me to write something about "matte shots" as we call them in this studio, and I will try to describe the process of making them and how they can be used to best advantage.

Fred W. Sersen

Some will say "we have 'glass shots' and 'miniatures,' why use matte shots at all?" There are times when either one would do and again there are cases when some process will do better than others. I will enumerate some instances when the matte shots can be used to better advantage than anything else.

Sometimes the sets are not exactly as they should be, due to many reasons — incidents that come up daily—such as changing the script at the last minute, or the director may have some idea of his which came to him on the spur of the moment. Or the cameraman may see better composition if he shoots the set from a different angle, due to change of light or some other unforeseen reason, or to create a beautiful scene where one did not exist.

The use of a matte enables a cameraman to make the picture he visualizes. He is no longer limited by the size of the set, poor light, etc. It makes it possible for him to create and carry out the ideas he has for the enrichment of the production. I have seen cameramen by the use of ingenuity and mattes double the value of a production.

For instance: A company went to Nevada to photograph some battle scenes in a snow storm. To build the sets there would have been very costly, while without them the desired Russian atmosphere could hardly be obtained. (It happened to be a Russian picture). While they were walking around looking for the most suitable locations, they happened to run across an old concrete dam. The cameraman, being of a highly creative mind, began to visualize an old fortress connected with that wall of concrete, and before long he had a matte cut out of a piece of card-board and placed in the matte box so as to block out that piece of scenery where the fortress was supposed to be. The scene was photographed and was finished in the studio very successfully showing a fortress of great production value.

In cases of this kind it is necessary for the cameraman to be able to visualize the complete scene so as to be able to make a matte in the right place and provide enough space for the object to be painted in. He has to use good judgment as to how sharp a matte to make. If

Left is portion of set built at the studio in which the player moves. Right is landscape painted by artist and put in by matting out portion of first shot and the double-exposing it in. Above is the result of the efforts of the artist and cinematographer.

there are definite lines in the picture it is easier for an artist to match to the sharp lines and it is best for the matte to be placed about thirty inches from the camera, even further if the glass or the material to be used for the matte is easy to obtain. Again when matting to the footage (especially when there is any wind blowing) or when dust is created by action in the scene, in a rain or snow storm, very soft blend is desirable and the matte should be placed four to six inches from the lens.

It is a difficult thing to make a good combination shot of rain, snow or dust storm with a glass or miniature, because of the distance between the real set being so much greater than that between the glass or miniature and the camera. In this case the matte shot is much the best. By double exposing or double printing the rain or whatever it may be, all over the film, makes it a perfect shot.

In combination shots where the mechanism of the miniature is too complicated, or if there are any other reasons that might delay the company while shooting, mattes are the most plausible remedy.

The process is very practical—when putting two or three exposures together, by matting out the undesirable portion of the picture one can double expose or double print anything right on the original negative, which eliminates the process of duping which means much to the quality of the film.

In practice the cameraman conceives the effects or settings he desires and directs his camera as if the scene existed. By using opaque paint or glass or snipping out a piece of black cardboard and placing it in a rigid position between the subject and the lens those portions of the scene are blocked out so that the film is unexposed in those parts to permit the subsequent exposure of the painting. The camera is "planted" to prevent further movement, and a test scene is made as nearly under the same lighting conditions as is possible. Then the actual scenes are made, a record being kept of the footage, fade-outs, etc.

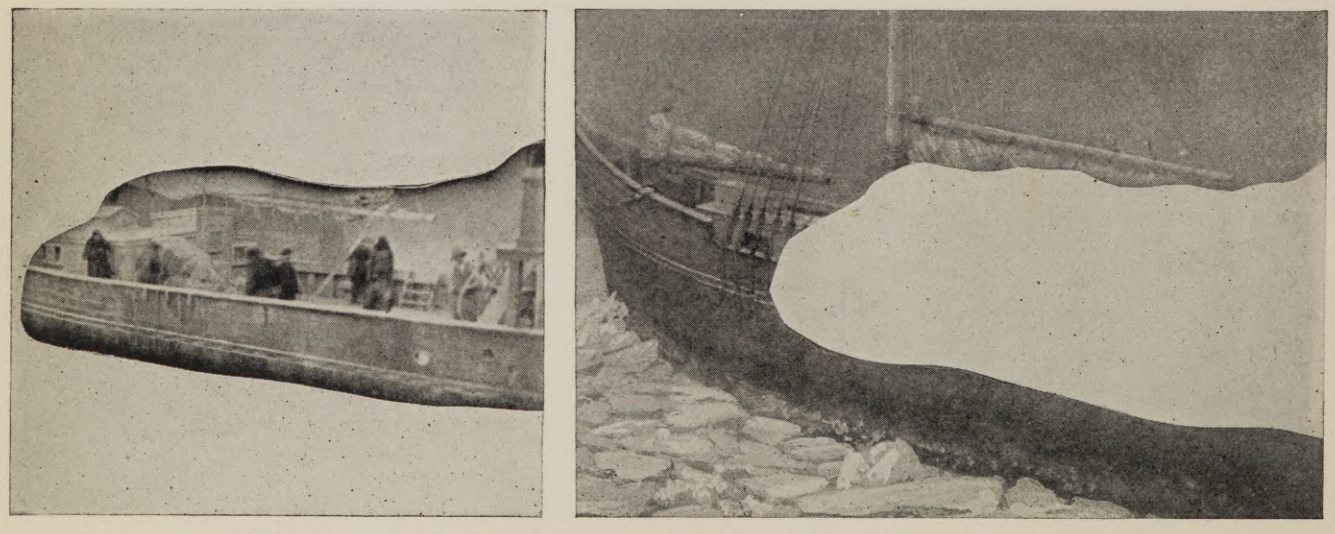
The test film, of which we usually have about one hundred feet, and the scene itself is turned over to the artist undeveloped. We take a few feet of the test and develop it, and this is used for lining up. There are several methods that can be used for lining up a "matte shot."

One can project the film through a camera on to a highly colored surface on which the artist is going to paint, and draw the outlines of the objects of the first exposure, which gave the base to draw to. After the drawing is completed, it is laid in with oil paint in black and white, and on the artist's ability and experiences depends the matching of the tones of the first exposure, which is ascertained by making the hand test and comparing the tones. He does this repeatedly by correcting the painting until the match is perfect. Another system is to line up the shot by using auxiliary aperture and looking through it to guide the drawing of the picture.

The third method is to double expose over the original exposure a black screen divided by white lines into one inch squares which are duplicated on the surface of the would-be painting, and the image of the original exposure is transferred by aid of these squares. It is the same system that is used by artists in enlarging a drawing. In all cases enlargements of 9x12 inches should be made in order to better see the details of the picture.

The system we are using in this studio and which is most practical in about seventy-five per cent of "Matte Shots" is to make an enlargement of the picture on the paper which is mounted on a specially prepared board. This gives the artist a perfect picture of the scene and he can work out his drawing, tones and composition and see the picture as a whole before he paints his reverse matte on. It eliminates a long and tedious job of lining up, which is connected with the methods previously mentioned. One can appreciate the advantages of this system better when there are numerous objects to match to a very accurate printing. To demonstrate this, I would describe a shot I made of changing Michigan Avenue in Chicago from a day to a night shot.

We took a day shot of Michigan Avenue with automobiles and pedestrians in busy commotion as only American thoroughfares can be, and had an enlargement made of it. I painted the enlargement of the day shot into a night effect and the match was so perfect that in a four-foot lap dissolve one could not detect any variation in form whatever. It was a rather complicated shot and here is the process we used. Day shot was duped with four-foot laid out. Into that we lap the painting of the city at night, and the automobile traffic was double printed in by using positive of a film we photographed



At left is section of ship built on stage and matted out by cameraman. At right is portion of ship painted by the art department. Above is the finished product after the cameraman and artist combined their efforts in a triple exposure.

on the local street which was exactly the same width and same elevation as in the day shot. The shot had to be photographed at dusk when the head-lights of the automobiles were on. The pedestrians on the side walk were printed in from the day shot as well as the lower part of the first stories of the buildings, with automobiles parked against the curb. Only those acquainted with this type of work can fully understand what it takes to balance the lighting and painting of these separate parts of a picture and what perfect mattes had to be used in printing hard edges of the automobile contours.

The enlargement comes handy when we have three or more exposures to be put into one picture. By making separate enlargements on the same piece of enlarging paper will give us perfect outlines to the mattes which are used for double printing as well as the connecting painting which is double exposed in. For instance, we had part of a boat built for the action of people moving about on deck which was backed up by painted backing. This was to be made into a picture of the boat cutting through ice in the Arctic sea, with the clouds passing by. We built the hull of the boat in miniature which matched the set boat built for the scene, and photographed it with speed camera, the miniature ice floating by. This was double printed into the original take, and painted to connect the two, and the rigging was doubly exposed afterwards. The real clouds were photographed moving in the proper direction, aided by panning the camera, and then double printed in, which required some fine matting.

Too much attention cannot be paid to the steadiness of the exposure, as the least movement in the film will cause a distinct movement between two exposures. The films should be measured so the perforations would be perfectly cut into the film when intended for matte shots, and the camera buckled down securely.

All the work should be done through a camera fastened to a title block fastened to a concrete pedestal.

New Kodascope Rapid Splicer and Rewind Ready

The new Kodascope Rapid Splicer and Rewind, pronounced by experts to be one of the most complete and efficient instruments of its kind ever produced, is now on the market.

The new Rapid Splicer and Rewind is, in appearance, similar to the Kodascope Rewind, except that it is considerably longer and is equipped with geared rewinds at the ends. In the center is affixed the splicing device.

The splicer is semi-automatic. With a single movement of the cutter bar, both ends of the films to be spliced are accurately cut. The end of the film is then moistened, and an ingenious scraping device passed backward and forward across one of the film ends. This thoroughly scrapes just the proper area of emulsion from the film, and lays bare the film base, ready for the cement. After the cement is applied, one movement of the right-hand portion of the splicer brings the film-ends together and an instant's pressure on the sealing device then distributes just the proper weight to insure a firm, perfectly aligned splice. The entire operation requires but a few seconds.

Both rewinds are geared four-to-one to enable fast work and examination of frames in either direction from the splicer. Two glass-stoppered bottles—one for cement and one for water—are conveniently placed at the rear of the splicer, and a two-ounce can of Kodascope Film Cement is furnished.

United Artists Building New Sound Stage

United Artists are constructing a new sound stage at the Hollywood studios which is expected to be one of the largest in the business. The stage will be 225 feet long, 132 feet wide and 73 feet high, and will be large enough to accommodate outdoor sets. Even a huge pipe organ is to be included along with ten camera booths.

Amateur Movie Making

Continued from Page 27

can hardly be expected to use a definite script, but they can and should know fairly accurately just what is to be done and how to do it. While a written outline is invaluable, it is not always practical; but a clear mental picture of what is to be photographed is almost always possible, and the ability to visualize beforehand should be cultivated. It is an essential to successful cinematographic work of any kind. It expedites the actual shooting, and saves film in the really practical way. It makes the work easier, quicker, and more beneficial. And no really great cinematographer or director has ever been without this power of visualization; it is the prime foundation of success in screen art. Therefore, it is the one thing above all others that the amateur should seek, master, and cultivate if he would realize his aspirations toward true cinematographic artistry.

Italy

It is announced that the Cines Studios in Rome, which are the largest in Italy, will be turned into sound studios.

England

Supreme Film Ltd., announces through the British Press, the production of feature pictures by an entirely new sound film process, which is known as the "Aperiodic Non Microphonic" process. The films will be available for any sound film reproducing apparatus.

All In the Day's Work

Continued from Page 4

years ago had his camera in a plane to shoot closeups of Jack Mulhall and Dorothy Mackaill. The plane was too heavily loaded for flying. The outfi,t was warned, but they did want that scene. So the plane started down the runway. Suddenly it took off a few feet and then shot back for the ground. By a miracle the ship landed without mishap. But there was a terriffic jolt. And there was Arthur hanging on to his camera, hoping it would not be broken.

Yes, the stunt men and actors do some brave things in the air for the sake of thrilling the public. But they are highly paid and get much publicity out of it. But the unsung heroes, the cinematographers, are always "on the tail" of their ships—only you rarely hear about it.

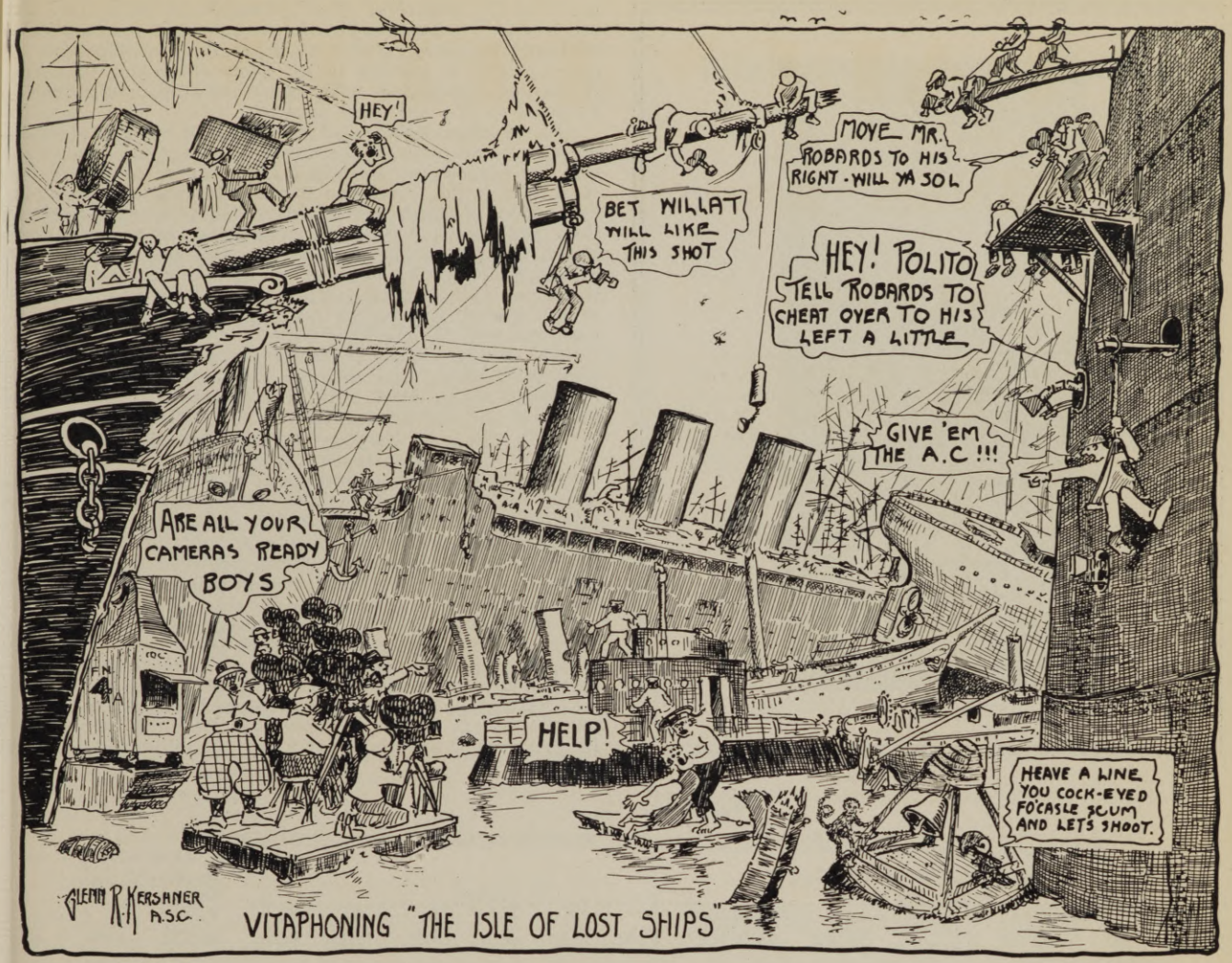
"Hell's Angels" to Open in October

Caddo Productions' great air picture, "Hell's Angels," is at last tentatively scheduled to open in New York in October. Present plans call for the premiere of this picture at the George M. Cohan theatre where it is planned to stage an extended run.

More than two years' work have been put in on this production which the youthful producer, Howard Hughes, hopes will be the greatest air picture ever made. Reputed cost is more than $3,000,000. Sound, dialogues and color effects have been incorporated in the picture.

Harry Perry, A. S. C., has had complete charge of the photography of this picture. Under his cinematographic direction scores of cameramen have worked for months, much of the time in the air, and Mr. Perry is highly enthusiastic over the air photography.

The Lyric Film Exchange, which operates the new Lyric Theater in Manila, announces that it will install a talking moving picture outfit in its theater sometime before July.



Fine Grain Developer

Continued from Page 18

about three minutes longer to produce the same degree of development than the other methods. All the data on rate of development recorded were obtained by the rack and tank method unless otherwise stated.

To interpret correctly the data represented by the time-gamma curves, it is necessary to know the gamma that is used in current practice and the limits in terms of gamma for flat and contrasty development. It was found necessary to determine the degree of development in current use in the commercial film laboratories. Sensitometrically exposed strips of film were sent to nine of the film laboratories in Hollywood, Calif., and developed under normal processing conditions. The gamma values varied from 0.44 to 0.70 with most of them falling in the range from 0.55 to 0.65. H. & D. strips were developed together with a large number of customers' negatives taken outdoors that were developed by judgment in the Eastman laboratory, and these gave an average gamma value of 0.80. This higher gamma value is necessary in the case of commercial negatives taken under average conditions in the eastern part of the United States because the brightness contrast of the objects photographed outdoors is not so great as that prevailing in Hollywood.

The maximum gamma that can be obtained depends upon the nature of the emulsion used, the developer, and the method of development. For Eastman motion picture panchromatic negative film (type 2) with the borax developer and the rack and tank method, the maximum gamma is 1.4. Since the average gamma of studio negatives is around 0.65, it is seen that ample contrast is obtainable with the borax developer.

In the study of the developer formulas it is necessary to consider the fog produced as well as the rate of development. The three curves at the bottom of Fig. 2 show the fog values for the borax developer for three different development temperatures.

(C) Watkins Factor

Some workers, who develop negatives by judgment, observe the negative during the early stages of development and determine the time of appearance of the first trace of image. The factor by which this time must be multiplied to give the desired time of development for a normal negative is called the Watkins factor. Tests have been made with various types of negatives in fresh and used fine-grain developers and the Watkins factor has been found to be 8.0 for a gamma of 0.7.

(D) Variation of Properties with Methods of Mixing

In some preliminary experiments, variations were found in the rate of development for different batches of the same developer. A test was made to determine the effect of varying the mixing temperature. One developer was compounded[10] with water at room temperature (65°F.) and another with water at 180°F. Both developers gave the same rate of development. From this it was concluded that the early variations were due to errors in compounding the developers. It is necessary to exercise great care in weighing out the correct quantity of borax because the borax developer is very sensitive to slight changes in alkalinity. In a very dry climate, borax should be stored in a closed vessel to prevent any loss of the water of crystallization.

(E) Function of the Constituents of the Borax Developer

(1) Developing Agents.—Elon is the principal reducing agent and is responsible for starting the develop-

ment of the negative. The hydroquinone helps to build up the heavy densities, but if used alone, it does not have sufficient reducing power to start the development. If development is started in an Elon developer, however, it can be completed with one containing only hydroquinone as the reducing agent.

(2) Sodium Sulfite.—This salt is an inorganic reducing agent and protects the developing agents from oxidation by the oxygen absorbed from the atmosphere. Its solubility in the developer formula is such that the concentration of sulfite can be increased from zero to more than 200 grams per liter. An increase in concentration above 100 grams per liter slightly decreases the rate of development partly because of its solvent action upon the silver halide in the emulsion. This solvent action is of the utmost importance from the standpoint of graininess and will be discussed later.

(3) Borax.—This chemical is used because it is a very mild alkali and gives a developer with very low alkalinity when used with a mixture of Elon, hydroquinone, and sodium sulfite.

(F) Effect of Varying the Concentration of the Developer Constituents

The rate of development, speed of emulsion, fog, graininess, etc., produced by the borax developer can be altered by changing the relative concentrations of the constituents used in the developer and by the addition of other chemicals such as potassium bromide, hypo, and sodium sulfate. Several experimental developers were compounded in an attempt to decrease the rate of development without decreasing the speed of the emulsion or increasing the fogging action. The tests were made with a small developing apparatus, but with the same technic as used in commercial work. H. & D. curves were made for the various development times and the gamma values determined as shown in Table II. The fog values and Eastman speed are given for a gamma value of 0.70. The

Table II

Effect of Variations in Composition on the Properties of the Borax Developer

Expt. No.	Constituents of Developer Grams per Liter					Gamma						Data at Gamma of 0.7		
	Elon	Hydro-quinone	Sodium Sulfite	Borax	Potassium Bromide	6 Min.	9 Min.	12 Min.	15 Min.	18 Min.	21 Min.	Relative Speed	Fog	pH
1	2	5	100	2		0.41	0.58	0.73	0.82	0.91	1.00	530	0.20	8.5
2	2	5	100	2	0.1	0.38	0.52	0.67	0.76	0.85	0.94	740	0.18	8.5
3	2	5	100	2	0.5	0.37	0.51	0.66	0.74	0.84	0.91	646	0.16	8.5
4	2	5	100	2	1.0	0.34	0.48	0.62	0.72	0.80	0.86	450	0.15	8.5
5	2	5	100	2	2.0	0.33	0.44	0.54	0.65	0.75	0.82	412	0.15	8.5
6	2	5	100	2	5.0		0.35	0.44	0.56	0.66	0.71	150	0.08	8.5
7	4	5	100			0.35	0.52	0.67	0.76	0.85	0.93	635	0.13	7.8
8	4	5	100	2		0.43	0.60	0.71	0.80	0.90	0.98	660	0.15	8.1
9	4		100			0.35	0.50	0.61	0.71	0.80	0.86	590	0.15	7.9
10	2	5	100	20		0.72	0.92	1.03	1.11	1.20		550	0.16	9.2
11	2	5	100	6		0.53	0.72	0.89	0.98	1.04		575	0.20	8.9
12	2	5	100			0.31	0.47	0.60	0.67	0.73		490	0.18	8.1
13	2		100			0.31	0.48	0.60	0.67	0.74	0.78	560	0.15	8.3
14	2		100	2	Sodium	0.33	0.52	0.62	0.70	0.78	0.86	741	0.15	8.6
15	2	10	100	2	Sulfite Anhydrous	0.42	0.60	0.73	0.84	0.97	1.05	590	0.14	8.5
16	2	5	25	2	50	0.32	0.47	0.60	0.70	0.77	0.82	513	0.19	8.3
17	2	5	50	2	50	0.37	0.54	0.67	0.75	0.83	0.88	540	0.19	8.4
18	2	5	100	2	50 Hypo	0.29	0.50	0.67	0.75	0.80	0.87	500	0.18	8.5
19	2	5	25	2	1	0.32	0.41	0.55	0.64	0.74		390	0.14	8.4
20	6		100	6		0.55	0.71	0.85	0.93	0.98	1.06	660	0.15	8.3
21		10	100	20				0.28	0.37	0.53	0.67	360	0.16	9.2
22	1	2.5	50	1	Potassium Bromide	0.32	0.46	0.54	0.64	0.67	0.75	670	0.20	8.7
23	1	2.5	100	1		0.34	0.47	0.57	0.64	0.73	0.80	780	0.19	8.8
24	1	2.5	100	1	1	0.26	0.37	0.51	0.61	0.70	0.77	427	0.11	8.8
25	1	2.5	150	1		0.29	0.40	0.50	0.60	0.68	0.73	690	0.17	8.9
26	2	5	25	2		0.38	0.55	0.67	0.73	0.80		468	0.17	8.3
27	2	5	50	2		0.37	0.59	0.70	0.81	0.90	0.95	692	0.16	8.4
28	2	5	100	2		0.41	0.58	0.73	0.82	0.91	1.00	530	0.20	8.5
29	2	5	150	2		0.33	0.50	0.62	0.72	0.80	0.88	676	0.14	8.7
30	2	5	200	2		0.26	0.36	0.47	0.60	0.67	0.76	646	0.17	8.7

Recent Releases of A. S. C. Members

"Blockade"—R.K.O.—Robert Martin.
"Gentlemen of the Press"—Paramount—George Folsey.
"The Lone Wolf's Daughter"—Columbia—James Van Trees.
"The Tip-Off"—Universal—Chas. Stumar.
"She Goes to War"—U.A.—Tony Gaudio.
"Laughing at Death"—R.K.O.—Virgil Miller.
"On With the Show"—Warners—Tony Gaudio.
"From Headquarters"—Warners—Wm. A. Rees.
"The One Woman Idea"—Fox—L. W. O'Connell.
"The Studio Murder Mystery"—Paramount—Victor Milner.

New Projector Announced

LONDON—Development of a new projector, financed by a London syndicate, has just been announced here. The claim for the new projector is that it will eliminate shutter intervention and offer advantages in the projection of colored and talking pictures.

The inventor claims that with the use of a continuously moving film the projection of talkers is enhanced, claiming perfect synchronization between sight and sound results. The flicker disappears with the absence of the shutter and the film is projected at the same rate of speed as film is taken, he says, declaring breakage and damage of sound track or colored film will be reduced.

same roll of Eastman panchromatic negative film was used for all of the tests. The type of H. & D. curve obtained with this emulsion is shown in Fig. 1. The developers are arranged roughly in the order in which they were tested and in terms of the extra constituents which were added.

(1) Effect of Varying the Concentration of the Developing Agents.—It is possible to double the concentration of Elon and hydroquinone in the regular borax formula. This increase produces a solution which is so near the saturation point with respect to these chemicals that it is not of practical interest.

The Elon content alone can be doubled but this produces no appreciable increase in the rate of development because the effect of the Elon is offset by the decrease in alkalinity (Nos. 1 and 8, Table II). The effect that can be produced by an increase in the borax content will be discussed under "alkalinity."

Continued in the August Issue

Actors Now Argue with Selves via Movietone

HERE we see Alan Burmingham talking to himself in a scene from a Fox Movietone picture, "Masquerade." This is the first dual role made in Movietone. The remarkable feat of showing an actor playing two roles in a closeup shot and talking at the same time is what has been accomplished. Dual roles in the silent drama have long been customary, but to double expose the voice is a new wrinkle. Note the photograph of the man's voice on the sound track on the top of the film.

German Scientist Remarkable Figure at Age of Seventy

An article appeared in the May issue of the **American Cinematographer** under the above heading, in which some of the achievements of the German Scientist, Dr. Paul Rudolph, were mentioned.

Quite a voluminous correspondence has reached the desk of the Technical Editor in reference to it. Some letters referring to errors, which apparently had crept into it, could not be set aside and for the sake of correctness we gathered some definite information from a source, which we consider most authoritative and reliable: Dr. Hovestadt's book "Jena Glass and Its Scientific and Industrial Applications."

It is well known that the Science of modern optics was born through the remarkable work conducted by Professor Abbe and Dr. Schott at Jena. Professor Abbe evolved the system of complete pre-determination of all the data necessary for the construction of microscopic and all other optical systems, and his new theories and formulae of lens optics remain as a monument to his fecund genius. However, he soon found himself up against the lack of suitable raw material. Most of the optical glass obtainable at that time came from England, but only very few varieties existed and these were sold according to their specific weight.

In collaboration with Dr. Schott, Professor Abbe conceived the idea of varying the optical properties of glass by introducing new materials into the formulae. It is due to the perseverance and energy of Abbe and Schott that after many years of experimental work, optical glass was produced on a scientific basis and in many varieties. Such glass alone made possible the construction of optical systems according to the pre-determined computations of the new optical theories of Professor Abbe. The association of Professor Abbe and Dr. Schott proved extremely fruitful, and universal recognition of their work materialized for the first time, when the new microscopes built according to Abbe's formulae and with Schott Jena Glass, led to the epochal discovery of bacteria as the cause of many infectious diseases.

It was after this that Professor Abbe, the head and owner of the firm of Carl Zeiss, engaged Dr. Rudolph as his disciple and assistant. Dr. Rudolph worked under and in intimate contact with Professor Abbe, when he developed, on a plan suggested by Abbe, the famous Anastigmat lens. This remarkable objective, conceded to be the corner stone upon which modern photographic optics are founded, has justly brought undying fame to the two men who devoted much energy, vision and scientific knowledge to its development.

Dr. Rudolph in 1908 retired from his professional occupation in the Zeiss Works, due to various commercial reasons, but in 1917 the exigencies of the war laws for civil service brought him to resume his activities with the Carl Zeiss firm of Jena. It was in connection with this work that Dr. Rudolph developed the Plasmat objective and submitted it to Zeiss. Zeiss, after examining the new objective, saw no advantage in it, and they raised no objection to Dr. Rudolph's offering his new lens to a competitive firm.

The services rendered by Dr. Rudolph in the construction of modern photographic lenses are indisputable. It is also an historical fact that to Professor Abbe, the spiritual founder of modern optics, and to his inventive genius we owe the inauguration of the present era of photographic developments.

We are glad of having the opportunity to present to our readers what we believe to be the true facts relative to this extremely interesting period in the history of photography.

Royalty Shoots Its Own

Royalty is now joining the rapidly growing ranks of amateur movie makers, and report has it that cinematographic enthusiasm is running high in the palaces of England's royal family.

The Duke of York, second son of King George, is the first member of the family to become an amateur cinematographer. His latest home-made production features his 3-year-old daughter, Princess Elizabeth. The "World Premiere" was held at Craigwell house. Both the king and queen are said to have applauded the work of the young star as well as the technique of the duke-director.

Cinophot and Dremophot Exposure Meters for Amateurs

One of the constant cries from the amateur who is just beginning his picture making is to the effect that he does not know what exposure is correct under various conditions. The result is that he wastes many, many feet of film, and loses many excellent shots.

What are the correct exposures for sun and twilight, studios, interiors, mountain scenes, seascapes, titles and the like? That is the ever-present question in the amateur's mind.

This worry can readily be greatly removed if the amateur will avail himself of the opportunity to buy one of the Drem Products Corporation's devices for this purpose. The company manufactures the Dremophot and the Cinophot exposure meters. The Dremophot is specially adapted for Bell & Howell Filmo 70 and 75. The Cinophot is used on the Eastman Cine-Kodak, but may be used on the other movie cameras as well, such as DeVry, Victor, etc. An investment in one of these useful devices will save much waste footage and disappointment.

Japan

A Japanese Film consortium, "The Matsutake Film Company," decided to establish a branch in Berlin with a view to producing Japanese films in Germany. This is the first time a Japanese film concern has attempted to establish its business outside of its own Country.

Accomplishment

Continued from Page 11

"Yes," Sheila answered eagerly. "Tonight, if you like, but let's stay home. I don't feel like going out."

Another pause, then: "As you wish, Ma Cherie. Until tonight, Au Revoir."

Sheila hung up, heartened, encouraged. It would be good to see Sir Charon. Happily, she busied herself about the house. She even considered rearranging the rooms. If Del had—why should she think of Del whenever Sir Charon came to mind? Surely Del had walked away from her for the last time. And yet—the door bell rang.

She answered the summons. It was Del, with a big bundle of her father's personal things from the armory. A different Del. This one no longer had steel-blue eyes and granite-like face. His eyes were soft as baby's eyes. Tired eyes. She realized that whatever had made them hard was gone, gone forever, and, womanlike, she seized the advantage they offered by putting into her own the hardness which had once been his.

"You may put that bundle there on the divan," she said when he told her what he had brought. She could be hard now. Sir Charon had called her—he was coming tonight to comfort her. Yet, Sheila could not keep her gaze entirely away from the shining bronze medal hanging from the stalwart American's breast.

He began checking the contents of his bundle. A full-dress uniform. Several uniforms worn by the Queen's soldiers in the tropics. A saber. Several campaign medals, Sheila grabbed them.

"He was a better soldier than you'll ever be, Del Wilton," she said vindictively; at the same instant her gaze caught the D. S. C. on the broad chest before her and she bit her lip. Why should she want to hurt Del? Del was right. She had been a little snob, was behaving like one now.

"He was," Del corroborated evenly.

His very willingness to be agreeable spurred the evil impulse to wound him she had regretted before he spoke.

"If it had been the other way around, dad would have had the guilty man lined up in front of a firing squad long ago," she declared and dared to look at him. She expected anger, fury, anything but to see those hurt blue eyes remain hurt and baby-soft. She realized then the unfathomable depth of her love for him! She had always loved Delavan Wilton! It had been fun to tease him, that was all, and now that he was lost to her she knew she loved him! She hung her face to hide the tears.

"Perhaps you-all are right," Del said, in that exasperatingly cool and drawing voice. "I may be the dumbest bloke in the world, but if you can tell me how in the name o' God you can trace a murderer with these as the only clues, I'll wade through hell to do it!"

FROM a pocket he took two objects which Sheila stared at uncomprehendingly. One was a torn piece of grey tweed, apparently the fragment of a man's coat. The other was a crushed, withered remnant of a goldenrod chain.

"What—I don't understand," she said haltingly.

"These were clutched in your father's right hand when they found him in his plane," Del explained. "Apparently

he tried to grapple with the bloke who shot him, but all he could do was grab the skunk's coat. His murderer got away leavin' only a piece of his lapel and this goldenrod chain as evidence. Hell, only luck will ever turn up the louse who shot your father."

Goldenrod chain? Luck? Sheila frowned. Why should those words stir some half forgotten memory? Why was there something vaguely familiar about that torn fragment of cloth? A goldenrod chain. Goldenrod. The first real goldenrod she had seen in years were those she and Sir Charon had picked that day—THE goldenrod chain! Her fingers at his lapel, her voice whispering: "Wear it, it will bring you luck." Luck? Sir Charon had on a grey tweed coat, and the pattern of that torn bit in Del's hand was the pattern of Sir Charon's—Then she remembered the cameraman.

"Oh," she gasped, her eyes wide with horror, "it can't be. It's not so!"

"What's not so?" demanded Del.

She looked up at him, her face a mask of horror.

"Oh, Del," she wailed. "I made that goldenrod chain and put it in that lapel not more than ten hours before dad was killed!"

"What!" Del snapped—then a shadow of pity crossed his face—"aw you poor kid, you-all have had a tough time—honey, you're all tired out . . . " He stepped close to her and embraced her tenderly.

"No—no, Del," she sobbed, "that day with Sir Charon —the day—we took some pictures . . . ."

"Wait, de-ar, who the hell is Sir Charon?" he interrupted her. Then he remembered. Sir Charon Haydon-Winnington, diplomatic corps, highborn—

"Listen!" he commanded. "What does this bloke look like? Here, wait a second." He brought a handful of papers from an inner pocket, selected one, spread it on the table before her. "Is this the bloke?" he demanded.

Sheila looked and a cry escaped her. The picture swam before her eyes. She saw the paper was printed in French. She felt herself slipping. "Yes," she said faintly, "that is Sir Charon."

In a daze she heard Del slowly read: "A master spy. German. Escaped from La Roquette prison. Wanted for espionage and wholesale murder. Correct name: Baron Elrich Von Sternburg," and so on Del read monotonously until he ended with the signature of the French Prefect of Secret Service.

It was a record that the devil himself might be proud of. Somehow, the revelations stirred a world of energy in Sheila Standish.

In five minutes Del learned every fact Sheila had concerning Sir Charon, from their meeting at a diplomatic ball, to his telephone call early that afternoon. And while talking, her hands rummaged through a cabinet drawer until she found a small roll of celluloid film.

"Look!" she exclaimed. "Here's the picture we took that day. The cameraman brought it over the day after dad's funeral," she gulped—"I had completely forgotten it; never even looked at it."

"Let me see it, honey," Del said, and took it from her hand.

Holding it toward the light, he slowly unwound the film and exposed to their eyes the entire scene which the cameraman had shot that day in the goldenrod field. Del stopped when he came to the scene where Sir Charon put his arms around Sheila. "It's the bird the French want, I reckon," he snapped, "but let's put it on your projector to make su-re."

Quickly, they put the film into the machine and turned on the motor. Del snapped off the lights, plunging the room in darkness. Again the picture was revealed before their eyes. It was now life-life—to Del revoltingly life-like.

"Well, he's the bloke, the . . ." he choked back bitter curses—"I reckon he was playin' you-all because you were Colonel Standish's daughter, an', oh well, I had no way of knowin'. I didn't get this circular until today, an' o' course no commoner ever suspects a highborn. . ."

"Oh, Del, please don't say that again."

"All right, honey. Now! I'll tell you what we'll do." he said authoritatively. "When he comes, bring him into this sittin' room, then. . ."

"Oh, Del, oh, no, I can't!" Sheila sobbed. "I can't ever face him again."

"You must, honey," he said. "It's the only su-re way o' nailin' him! It's up to you-all to tag your dad's murder on him an' I'll be in the dinin' room as witness. When he sees these pictures he'll give himself away su-re. Then I'll nail him! You-all must do it, honey!"

He held her away from him so he could keep his eyes on hers.

"I love you-all, Sheila, de-ar," he continued, his voice again low and drawling, musical. "I love you-all mor'n life, just like your dad loved you. Shore you'll go through with it fo' two men who loved you-all that much?"

She gave a throaty cry that was joy, relief, and a dead hope revived, as she clasped the big hulk of him to her, kissed his eyes, his forehead; wet his cheeks with a shower of hot tears. Del loved her more than life itself! What was there to fear now? How could Colonel Wyndam Standish's daughter, loved by Del Wilton, fear anything?

"Yes, dear, yes—what do you want me to do?" she asked, and Del stifled a sigh of relief at the calmness of her voice.

"First, I want your promise to marry me—tomorrow! —an' let me protect you-all forev-er."

"I promise, Del, and—oh, I love you so much!" Again she fell into his arms.

"Honey—honey," he stammered, "an' you-all will go back to America with me? This war will be o-ver, an' then. . ."

"Yes, dear," she gasped for joy.

"Good! Now listen, this is what we'll do."

Twice he repeated the details slowly, carefully. "Got it now?" he asked, and the voice was that of a fighting man, not a sweetheart.

"Yes, dear," she said gravely.

"An' remember," he emphasized, "if he does grab you, don't struggle! For the love of God, Sheila, don't fight! Because I might kill you!"

"All right, Del," she assured him and he knew she would not fail.

FOR ten minutes Del sat in the dining room and talked with Sheila in whispers. His eyes continuously strayed through the window to the street. As darkness was falling he saw the blue roadster draw up to the curb. Grimly he watched a dapper civilian step jauntily to the sidewalk and approach the house.

"He's he-re, Sheila," Del whispered hoarsely. "Steady, now. Remember what I told you!"

The stage was set for their live's greatest drama.

A bell rang. Sheila, pale, but to all outward appearances calm, went to the outer door. Del crouched behind a portiere that shielded him from view of anyone in the living room, but from where he could command it. As the sound of voices drifted to him, he carefully cocked his automatic pistol. He stiffened as the living room door opened and closed.

"Do you mind sitting here a minute?" It was Sheila's voice. "I was just having a bit of tea," she nodded toward the cup and teapot. "Will you have a cup, Sir Charon?"

As she spoke she indicated a chair that would place Sir Charon with his face toward the darkened dining room.

"Ah, yes, Ma Cherie," Sir Charon accepted, seating himself. Del Wilton studied his face and elation quickened the American's pulse.

They talked commonplaces while Sheila prepared the tea. She set a cup before him and as he raised it to his lips, she plucked the torn piece of tweed and the remnant of goldenrod chain from her bodice and tossed them on the table before him.

"Where did you lose those, Sir Charon?" she asked, stepping back a pace.

EVEN Sheila was thrilled by the spy's nerve. Nothing very perceptible happened. Slowly, deliberately, he replaced the cup in the saucer. Just as slowly, steadily, his right hand went under his left arm and came out

holding a shiny automatic. He didn't point it at her, just held it alert.

"Ah, my sweet, is this a doublecross?" he asked softly. For a fleeting instant wondrous eyes swept the room, then he smiled.

Sheila smiled, too. Del told her this would be the time to smile.

"No," she said, "if I'd wanted to doublecross you, I could have done it long ago. I knew the Intelligence Department was after you. But I liked you, and,"—was it a sob or a laugh that caught in her throat?—"I didn't get along so well with dad. He tried to make me play spy, too."

She paused, poured herself some tea, and indicated the cup before Sir Charon with a gesture. "There's no poison in it," she said calmly, "go ahead and drink."

He put his gun back in its holster, lifted the cup in a semi-salute, and without taking his eyes from her, he drank.

"Sir Charon, do you remember the cameraman that day, and the pictures he took of us?"

"Yes, Ma Cherie, why do you ask?"

"I have them. Would you like to see them on the screen?"

"That would be jolly, rippin', eh?"

"Turn your chair around facing the other way, and don't be afraid when the lights go out!"

He turned his chair, perfectly at ease, and she switched off the lights and switched on the projector. In a moment a beautiful scene flashed on the screen before them. They saw themselves sitting in Sir Charon's blue roadster; saw the goldenrod field, her arms full of flowers; he trying to kiss her; then she said, and her voice labored with emotion:

"I was ready to go with you that day, but you didn't seem to care enough. A girl likes to be rushed, Sir Charon."

"Ah, my sweet," he replied, "you are so won-der-ful, I did not know, you"—the picture came to the scene where she put the goldenrod chain in his lapel—"were this Colonel Standish's daughter, until I read about it in the bulletins the next day."

The film drew near the end and, "however," he continued, "I am sorry I had to do it. Will you. . ."

"Oh-h-h-h!" Sheila groaned in the darkness, and in that one grief-stricken exclamation, Baron von Sternburg knew he had been doublecrossed! That same instant the lights went on. The German quickly drew his ugly automatic with his right hand and swept it in the arc of a circle to bring it to bear on Sheila, but a bullet from Del's gun smashed his hand. Sheila, not knowing which had fired, fainted.

Von Sternburg snarled out an oath in bitter Teutonic and sprang back toward the wall, facing Del, still with his finger on the electric switch. His eyes fell on his pistol laying on the floor near the able.

For only a second he stood there, but in that tense period, which seemed a year, Delavan Wilton thought of many things. He thought of all that frequently occurs to keep these international spies from facing the firing squad. He thought of this one's inhuman escapades. He thought of Colonel Standish shot dead from behind, and hunched over at the controls of his airplane and clutching a torn coat lapel and a goldenrod chain.

Then he raised his automatic, squeezed the trigger, and—Baron Elrich von Sternburg, alias Sir Charon Haydon-Winnington—highborn—was no more.

Another story by Mr. Griffith will appear in an early issue of the American Cinematographer. Place your order with your newsdealer early each month so you won't miss it.

Precious Films May Be Saved

"What can I do to keep my films from cracking and becoming destroyed and useless?"

Again and again do we hear that question from the amateur who has, perhaps, a roll of film showing his little baby who has passed on. Perhaps it may be a reel of scenes shot at a scene that is almost sacred to him. To lose these films would be tragedy. But daily someone is losing a priceless treasure because the image has worn off, the film has cracked—has become worthless.

The composition of 16 mm. film is as follows: The acetate cellulose films contain acetate cellulose about 70 per cent, and about 30 per cent of plasticizers or ingredients for softening the film. These are such as castor oil, camphor, phenol phosphates and various pthalates.

The slow-burning or safety film contains, in general, two parts of nitro-cellulose, one part camphor, two to five per cent oil and traces of amyl acetate. Slow burning substances with a high flame point are added.

The emulsion on both kinds of film is composed of gelatine and sensitized substances like silver salts. The consistency of the base changes slowly through evaporation of the chemical binders. The film gets brittle and less pliable and in a few years will contract somewhat. The emulsion dries with time and may peel. Excessive moisture causes the emulsion to become sticky, causing friction on the tension springs in the projector, and producing streaks or "rain" on the surface of the emulsion. In time the film becomes worthless as the gelatine is destroyed and the image is worn off.

However, Albert Teitel of 105 West 40th Street, New York, has a process on the market which many noted authorities, such as Carl Louis Gregory, recommended as a "new life" process for films.

This process consists of the following: The film is saturated in an organic compound with a high flame point. Plasticizers are relaced and the film is then immersed in a composition of non-evaporating and slow-evaporating solution. Then the film is passed through a specially designed machine which removes all superfluous solutions, and is then finished with a soft silk buffer.

This process, it is claimed, will keep the film pliable for years. After so processing the film is lubricated and all foreign substances are removed and the image is given greater clarity.

The advantages claimed from this Teitel "New Life" method are: the life of the film is prolonged; film is cleansed and given better transparency. It runs more smoothly and sprocket tears are said to be eliminated, also buckling and gumming. And the frequent pad moistening in a humidor is eliminated.

Mr. Gregory, Fellow of the Royal Photographic Society of Great Britain, recommends this method heartily. Those who are having difficulty may write to Mr. Teitel or get information from retail dealers in film supplies.

On Tinted Film

Continued from Page 20

tinted film base having a density of 0.3 will necessitate advancing the volume control by either 2 or 3 steps. This represents a relatively small percentage of the total amplification and there seems to be little doubt that the required increase in amplification can be obtained satisfactorily.

The permissible change in volume occurring in passing from one tint to another is, in the last analysis, dependent upon the sensitivity of the ear to changes in volume. Under ideal conditions of observation, the change in loudness corresponding to a volume change produced by one decibel variation in amplification is just perceptible. It should be remembered that this change is perceptible only under ideal conditions. The situation is similar to that which exists relative to photometric sensitivity, that is, the sensitivity of the eye to differences in brightness. For instance, in a photometric field where the two halves are immediately juxtaposed in such a manner that when the two parts of a field are identical in brightness the division line is invisible, a difference in brightness of two per cent (actually 1.7 per cent) is just perceptible provided that the field subtends a visual angle of 3°, that the brightness level is optimal, and that all disturbing factors are removed. Such ideal conditions seldom exist in practical work, however, and it is customary to regard

Table I

Visual Characteristics

No.	Color Name	Hue		T	Description
		A	No.	%	
0	Clear base	--	--	100	Hueless, clear
1	Rose Dorée	63[illegible]	1.0	57	Deep warm pink
2	Peachblow	619	4.0	61	Flesh pink
3	Afterglow	603	7.5	66	Orange
4	Firelight	596	12.0	66	Yellow-orange
5	Candleflame	585	17.5	75	Orange-yellow
6	Sunshine	579	23.0	83	Yellow
7	Verdante	520	36.0	57	Green
8	Aquagreen	505	40.0	40	Blue-green
9	Turquoise	490	43.0	46	Blue
10	Azure	484	47.0	28	Sky-blue
11	Nocturne	476	51.0	28	Violet-blue
12	Purplehaze	455	56.5	38	Blue-violet
13	Fleur de lis	-575	60.0	25	Blue-purple
14	Amaranth	-557	64.0	31	Red-purple
15	Caprice	-537	67.5	53	Cool pink
16	Inferno	-508	71.5	30	Red-magenta
17	Argent			71	Hueless

Visual characteristics of the series of tints.

a brightness difference of five per cent as the least difference which is of importance. Similarly, in case of oral sensitivity, when the comparison is made between pure tones of the same frequency immediately juxtaposed in time and of a loudness to which the ear is most sensitive, one decibel is just perceptible. In practice, however, it is probable that 2, or even 3 decibels constitutes a more rational specification of the amplification change which will produce a just noticeable difference in volume.

On assuming, therefore, that a section of uncolored base is followed by a colored base having a photo-electric density of 0.3, the change in volume of six decibels will represent two, or perhaps three, just noticeable differences. Although this variation in most cases may not be unduly objectionable, it is felt that it is somewhat too great to meet the most rigid requirements. It is therefore proposed to establish also a lower density limit of 0.10 and to adjust the selective absorption of all the members of the series so that none shall have a density less than this value. Furthermore, it is proposed that when a hueless screen is desired a positive film tinted with a neutral (non-selective) dye be used. The photo-electric and, incidentally, the visual density of this is adjusted to a value of 0.10 corresponding to 2.0 decibels. If this material is used in conjunction with one having a density of 0.3 the volume change occurring at the transition from one to the other will be that corresponding to a change in amplification of 4.0 decibels. This total change is a

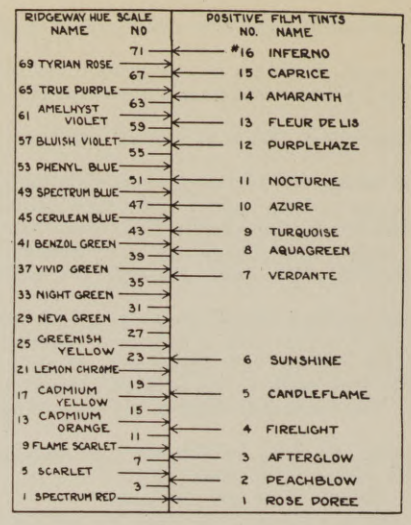


Fig. 4. Position of the tints on the Ridgeway Hue Scale.

little greater than the volume change which under practical conditions is just noticeable, and is certainly less than two such steps. It is felt that volume changes of this magnitude are entirely negligible in practical work especially since a change from one tint to another usually occurs with a scene change at which point a slight volume change may logically be expected.

It is of interest to apply this reasoning also to the case of maximum permissible density discussed in the previous paragraph. It will be recalled that a value of 0.3 for photo-electric density was fixed as being a reasonable upper limit. The amplification change required to give the same volume with such a film, as compared with clear base positive, is 6 decibels, which corresponds to two or perhaps three just noticeable volume differences. It is evident that this represents a relatively small increase in amplification and that no serious difficulty should be encountered in raising amplification sufficiently to compensate for the use of a colored base having a photo-electric density of 0.3.

The conditions which have been established, relative to permissible photo-electric density of tinted base for use in making sound positives, may be summarized as follows:

Maximum photo-electric density 0.3, amplification increment six decibels.

Minimum photo-electric density 0.10, amplification increment two decibels.

Table II

No.	Film Tint Name	Potassium		Caesium	
		D	T.U.	D	T.U.
0	Clear base	0.0	0.0	0.0	0.0
1	Rose Dorée	0.19	3.8	0.15	3.0
2	Peachblow	0.17	3.4	0.11	2.2
3	Afterglow	0.27	5.4	0.15	3.0
4	Firelight	0.27	5.4	0.11	2.2
5	Candleflame	0.24	4.8	0.09	1.8
6	Sunshine	0.27	5.4	0.06	1.2
7	Verdante	0.28	5.6	0.18	3.6
8	Aquagreen	0.26	5.2	0.27	5.4
9	Turquoise	0.10	2.0	0.24	4.8
10	Azure	0.09	1.8	0.27	5.4
11	Nocturne	0.09	1.8	0.28	5.6
12	Purplehaze	0.10	2.0	0.22	4.4
13	Fleur de lis	0.14	2.8	0.30	6.0
14	Amaranth	0.11	2.2	0.24	4.8
15	Caprice	0.09	1.8	0.14	2.8
16	Inferno	0.18	3.6	0.22	4.4
17	Argent	0.09	1.8	0.10	2.0
	Mean	0.176	3.5	0.184	3.7
	Maximum	0.28	5.6	0.30	6.0
	Minimum	0.09	1.8	0.06	1.2
	Maximum Δ	0.19	3.8	0.24	4.8

Photo-electric density characteristics of the series of tints.

Maximum variation in density 0.20, maximum volume variation four decibels.

It should be understood that the values of density specified above are relative to clear film base taken as equivalent to a transmission of 100 per cent, density 0. It seemed desirable to express all results in this manner since the factors of interest are those relating to the changes of photo-electric transmission, volume, etc., as compared to the conditions existing when the sound record is carried onto a clear film base.

On Table I are given data relative to the visual characteristics of these tinted materials. Considerable thought has been given to the names by which these tints are to be designated. It seems desirable, from a consideration of the probable associational and emotional value of color when applied to the motion picture screen, to designate these tints by names suggestive of their potential psychological effects and appropriate uses. This particular phase of the subject will be discussed in greater detail in a later section of the paper.

In the column designated as "y" under the title "Hue" are given the values of the dominant hue expressed in wave-length. These determinations refer specifically to the color of a white screen when illuminated by light from an arc of the reflector type with the tinted base placed between the light source and the screen. It therefore is a specific designation of the screen color

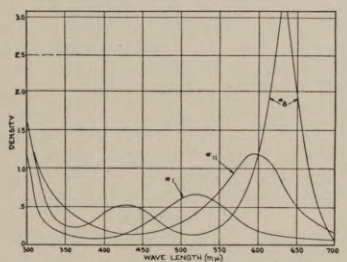


Fig. 5. Spectrophotometric curves for three tints.

obtained when these materials are used with a light source of this character. It is realized that in practice a certain variation in these hue values will result from the use of light sources differing from the one with which these hue measurements were made. For instance, when using a high intensity arc, either of the condenser or of the reflector type, the color of the emitted light is probably slightly bluer than emitted by a reflector arc using ordinary hard-cored carbons. Under these conditions the hue values will be shifted slightly. The difference, however, is so little as to be considered negligible from the practical standpoint. If these materials are used in a projector employing a high efficiency tungsten lamp there will probably be a rather great departure from the hue values indicated in Table I. This light is much yellower than that emitted by the arc and hence the use of a screen illuminated by a tungsten lamp in conjunction with these tinted bases will give appreciably different hues from those indicated in Table I.

In the column designated as "No." under "Hue" are the Ridgeway hue numbers. The system of color nomenclature developed by Ridgeway[1] is one of the best available. The entire hue gamut, including the spectral hues and the non-spectral purples, is divided into seventy-two hue steps. These hue steps are equally placed on the sensation scale. In setting up a scale of hue it is not satisfactory to adopt intervals which are identical in wave-length difference because the sensitivity of the eye to hue differences varies enormously throughout the spectrum. In order to establish a normal hue scale in which the steps are equal in terms of sensation, it is necessary, therefore, to use wave-length intervals differing widely in magnitude.

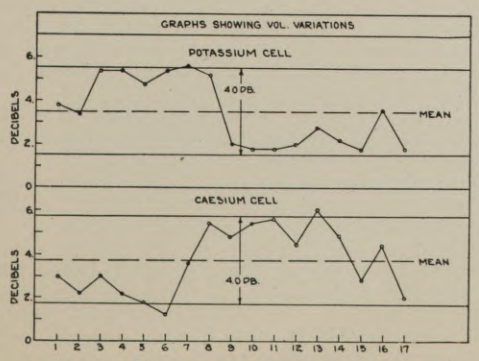


Fig. 6. Volume variation resulting from the use of the series of seventeen tints.

It will be noted that, with the exception of a region in the orange, yellow, and yellow-green, the hues of these tinted materials are fairly evenly spaced on the normal hue scale. It seems highly desirable to adopt such spacing since it makes available the entire gamut of hue and a change from one tint to another produces a hue displacement of known and fairly equivalent subjective magnitude. The positions of the dominent hues of these colors are shown graphically on the chart in Fig. 4. At the left are given the Ridgeway hue numbers and the names applied by Ridgeway to these hues when occurring in colors of high saturation. At the right are the Ridgeway hue numbers for the tinted positive films and the names applied to these. It should be remembered that these colors are in general of relatively low saturation. At the right are the Ridgeway hue numbers for the tinted positive films and the names applied to these. It should be remembered that these colors are in general of relatively low saturation and it is considered that these more delicate tints are of greater utility for use in applying color to the motion picture screen than those of higher saturation. It is a rather peculiar coincidence that the colors corresponding to the hue numbers 25 and 35 which are absent from this positive film series are those which, according to all of the available psychological data (see Luckiesh, loc. cit.), are the colors classified as least agreeable or least preferred. These color preference data are derived from a large group of observers and hence are very significant. It has been impossible thus far to obtain these hues with sufficiently low photo-electric density. Possibly further search may reveal dyes which will permit the manufacture of these hues if such seems to be necessary or desirable.

In the column designated as "T" are given values of total transmission for these colored materials as measured visually using the reflector arc as a light source. These values are therefore a direct measure of the screen brightness obtained when using these tinted materials as compared with the screen brightness existing when using clear base positive. It will be noted that the visual transmissions of the red, orange, yellow, and yellow-green colors are relatively high; while those of the green, blue, violet series are relatively low. This condition exists since it is desired to obtain fairly definite color saturation effects. It follows as a natural consequence of the visual sensitivity and transmission characteristics of dyes that the colors in the former group have relatively high visual transmissions for a specified color saturation, while the transmission values in the second the color characteristics.

group are in general low when a cerresponding color saturation is obtained.

In the last column are given short verbal descriptions of

To show spectrophotometric curves for all of the seventeen members of this series seems unnecessary but it may be of interest to consider two or three typical cases. In Fig. 5 are given such curves for tint No. 1 (Rose Doree), a warm deep pink; tint No. 8 (Aquagreen), a clear blue-green; and tint No. 11 (Nocturne), a deep violet-blue. Inspection of these curves shows that each of these colors has a decided density minimum throughout all or some part of that wave-length region in which the photo-electric response is maximum. The minimum density does not fall at the same wave-length in each case but shifts with the demands of the selective absorption necessary for obtaining the desired visual hue.

In Table II are given data relating to the photo-electric density characteristics of these materials for potassium and caesium cells of the types in extensive use in commercial installations. Density values are designed as "D," while in the columns designated as "TU" are given the equivalent values in decibels, these representing the amplification increment required to compensate for the volume depression occasioned by the use of these materials.

It will be noted that the specifications relative to maximum density and maximum density difference previously set forth as desirable have been made in actual materials with a fair degree of precision. In case of the potassium cell the maximum density is 0.28 (No. 7—Verdante), slightly less than the value of 0.30 considered allowable; while the density difference between the upper and lower limits is 0.19 (equivalent to 3.8 decibels), also slightly less than that considered tolerable. With the caesium cell the maximum density is exactly 0.30 (No. 13—Fleur de lis); while the maximum difference is 0.24 not appreciably greater than the specified 0.20.

The volume variation through the entire series of seventeen tints is shown in Fig. 6. The ordinates indicate the increase in amplification expressed in decibels required in each case to give the same volume output, with the tint, as indicated by the numbers at the bottom of the figure as compared with a sound record of identical characteristics on the regular clear positive film. The heavy horizontal lines are drawn at plus and minus 2 decibels from the mean of the entire group. These lines therefore define the allowable volume change as previously specified. In case of the potassium cell all of the tints fall between these limits; with the caesium cell two of the tints fall slightly outside these limits.

Prints have been made on all of these colored bases and sound reproduction with each cell is considered satisfactory, both with respect to the increase in amplification required and the maximum volume variation.

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Foreign News

Germany

"Ufaton" will be the designation for the future Ufa sound productions. The system is based on Ufa's and Siemens and Halske's photographic, acoustic and electrotechnical experiences. Every Ufa sound film will be made with a silent version.

A sound film studio is being built near Munich by a private Company. It will be leased to producers desirous of making talking pictures.

The plan of joining the sound film theaters into an international organization is taking shape. A German section has been formed.

Considering the lack of films, which is being felt now in Germany, the Association of German Exhibitors, has requested the Export Commission that distributors be authorized immediately to start filming imports under the new contingent, which was to become effective as of August 1, 1929.

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The Kavirondo tribe of East Africa believe in having many Head Men. Here are a few of them ready for something or other. Photo by Clyde DeVinna, A. S. C.

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